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CONTAINERPORT STUDY

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by
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waltham, massachusetts

DECEMBER 1974

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INTRODUCTION

This study has been undertaken jointly by E. G. Frankel, Inc. and CE Maguire, Inc. for the Boston Redevelopment Authority, the Boston Shipping Association, and the Massachusetts Port Authority to make recommendations as to the need for expanded containerized shipping facilities and their possible location.

The tasks involved consist of: a review and exchange of published documents and backup files prepared by the two consultants; a review of Massport material and records since these reports were issued; an examination of available data with respect to potential containerport sites, both inside and outside Boston Harbor; a review of research reports and forecasts available from federal, state and private sources; and discussion with members of the Sub-Committee of the Mayor's Advisory Council and staff members from the respective agencies. As part of this study consideration will be given to the role of container facilities with respect to the Port of Boston, and, in turn, the significance of the port to the City and region.

The report, as outlined in the table of contents has been structured to answer the following questions:

SECTION 1 -	What is the nature and substantiation of the market demand for expanded container facilities through the 1990 time frame?
SECTION 2 -	What are the facility requirements to meet this demand?
SECTION 3 AND 4 -	What are the potential locations at which such facility requirements could be satisfied?
SECTION 5 -	What are the key issues and broad effects relating to sites which merit serious consideration?
SECTION 6 -	What do the consultants recommend as the most suitable location to satisfy the immediate needs of expanded facilities, and how would the required facilities be developed?

We acknowledge the helpfulness provided by the agencies and individuals contacted in the preparation of this report.

ABSTRACT

The major findings and recommendations of this report are:

- Projections of market demand through 1990 continue to show a need for expanded containerized shipping facilities.

- Facilities should be expanded to provide for an annual 1990 capacity of 241,000 twenty foot equivalent containers (TEU's).

- The Moran Public Container Terminal at Mystic Wharf should be expanded at once. Such expansion is imperative to maintain the commitment made in the initial construction of this facility and to satisfy the ever increasing shipping demand. The likely capacity of this terminal when expanded to its practical limit is estimated at 100,000 TEU's annually. With Sea-Land's 35,000 TEU estimated throughput, this ultimate expansion will only meet the 1977 anticipated demand.

- It must be recognized that new waterfront facilities at the Moran Terminal could not be ready for operation before early 1978, even if the design process began at once. This includes the time required for permit processing, environmental assessment, engineering design and construction. If a formal Environmental Impact Statement were required then a further delay of approximately one year should be anticipated.

- Since 1990 demand cannot be satisfied at an expanded Moran Public Terminal, a new Public Container Terminal is necessary. Planning for such a facility should begin at once recognizing the many variables and agencies involved in determining its location.

- Potential sites for a new Public Container Terminal are at Castle Island, the South Boston Naval Annex and the East Boston Terminal. There are no practical alternative sites beyond the Inner Harbor.

- Castle Island represents the least cost alternative for on-site construction. Several constraints must first be overcome, however, and these will affect the total cost: waiver of Federal Aviation Administration regulations for intrusion by cranes and ship masts into Logan Airport approach zones; relocation within the Inner Harbor of some general cargo shipping operations now located at Castle Island; and extensive upgrading of the access routes through City streets to the highway network. It also has the advantage of developing a new terminal at a site already used partially for containerized cargo.

- The South Boston Naval Annex is a prime waterfront site which could provide sufficient space for a Container Terminal. Restrictions to development which must be overcome include: disposition of this property by the General Services Administration; compatible interface of terminal operations with other likely uses of the remaining property; and extensive upgrading of the highway access routes including bridge reconstruction.

- Both the Naval Annex and the Castle Island sites require extensive upgrading of the access routes along City streets to adequately handle present as well as future traffic. It is recommended that a complete upgrading of a route along Northern Avenue, including bridge reconstruction already in design stage, be undertaken in order to minimize local community impact.

- The East Boston Terminal is the third potential site for new container facilities. It has the advantage of an exclusive use right of way which would keep terminal traffic off adjacent local streets, but also represents incompatibility with adjacent off-site land use and community goals.

- Except for recommending immediate expansion at the Moran Terminal, no immediate decision can be made recommending the optimum location for a new Public Container Terminal. Based on the evaluations presented in this report the various agencies involved must at once begin the planning process necessary to make this decision.

- Concurrent planning at both Castle Island and the Naval Annex should begin at once to resolve the constraints listed and make possible a final decision for most optimum site.

- The most expedient short range expansion potential available to buy time for this planning process, after expansion of the Moran Terminal, is for the joint use of Sea-Land's Castle Island facility, that is crane and wharf, with backland obtained by relocating one or more of the present tenants. Such joint use may not be possible but should be explored.

1 MARKET DEMAND

INTRODUCTION

During recent years the movement of containerized cargo in the waterborne commerce of North East Atlantic ports in the U.S. and Canada has increased appreciably. A higher percentage of containerizable goods on high density routes such as the North Atlantic route to Europe and the U.S. East Coast to Far East routes are carried in containers every year. Simultaneously, new container routes are opened. The improved availability and efficiency of integrated containerized cargo handling not only results in continuous increases in the capture ratio (the percentage of containerizable cargo moved in containers), but also induces a growth rate in containerizable cargo movement far in excess of that projected without the availability of container services.

During the decade from 1960-70, container movements doubled nearly every 2 - 3 years (on a trade route or worldwide basis). As a result, container movements in and out of U.S. North Atlantic ports reached a level of 1.4 million/year (20' equivalents) or 11.3 million tons/year by the end of 1969. (See Table 1.)

Various projections of growth expected in the decade 1970 - 80 indicate a demand for handling 2.5 million tons per year by 1974 rising to 3.68 million tons per year by 1980. These forecasts are essentially based on extrapolations of past developments in container movements as shown in Figure 1. It is noted, (Figure 2), that during the period 1970 - 74, containerized cargo movements through the US North Atlantic ports increased linearly, with ports doubling their throughput every 2 - 3 years, consistent with developments in the sixties mentioned earlier. The question is whether this trend is going to continue. On one hand, economic conditions and the already high level of capture ratio indicate a turn down in the rate of growth. On the other hand, many new trade routes and services are being developed for container handling. Similarly, excess container shipping and more extensive terminal facility availability may improve the quality and cost of containerized service, to an extent where it attracts new or increased cargo movements.

It is the objective of this study to analyze these trends and develop a market forecast for container movements through North Atlantic ports and the port of Boston, in particular.

The market or demand forecasts presented are based on a number of alternative economic, facility and operational developments. This approach is taken to assure derivation of the whole spectrum of possible developments as they effect and are affected by container terminals in the port of Boston and competing North Atlantic ports.

PORT	FOREIGN		COASTWISE	
	Import	Export	Receipt	Shipment
Portland	4,988	33	9,676	12,239
Boston	184,123	13,751	10,206	70
Providence, R.I. & Harbor	2,069	1,811	30	464
New Haven Harbor	926	121	114,297	-
New York	3,640,445	1,350,786	731,254	1,056,716
Delaware River	643,157	166,093	15,124	7,144
Baltimore	272,381	188,330	19,906	121,502
Hampton Roads	322,635	206,175	1,338	6,364
Jacksonville	138,424	16,764	139,303	238,491

Table 1

CONTAINERIZED CARGO

1969

(short tons)

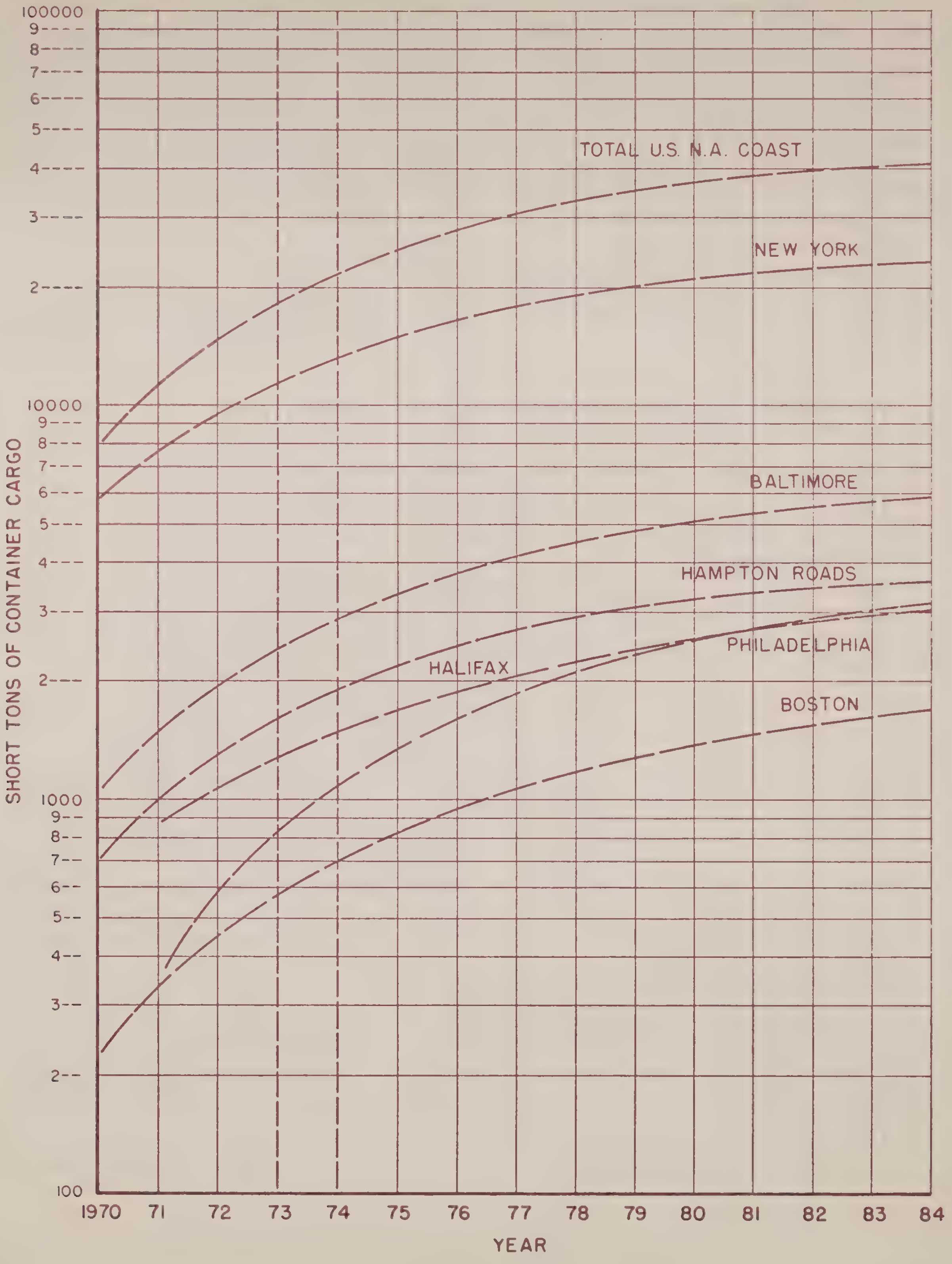


FIGURE I

CONTAINERIZED TONNAGE IN NORTHEAST COAST PORTS (in thousands to S.T.)

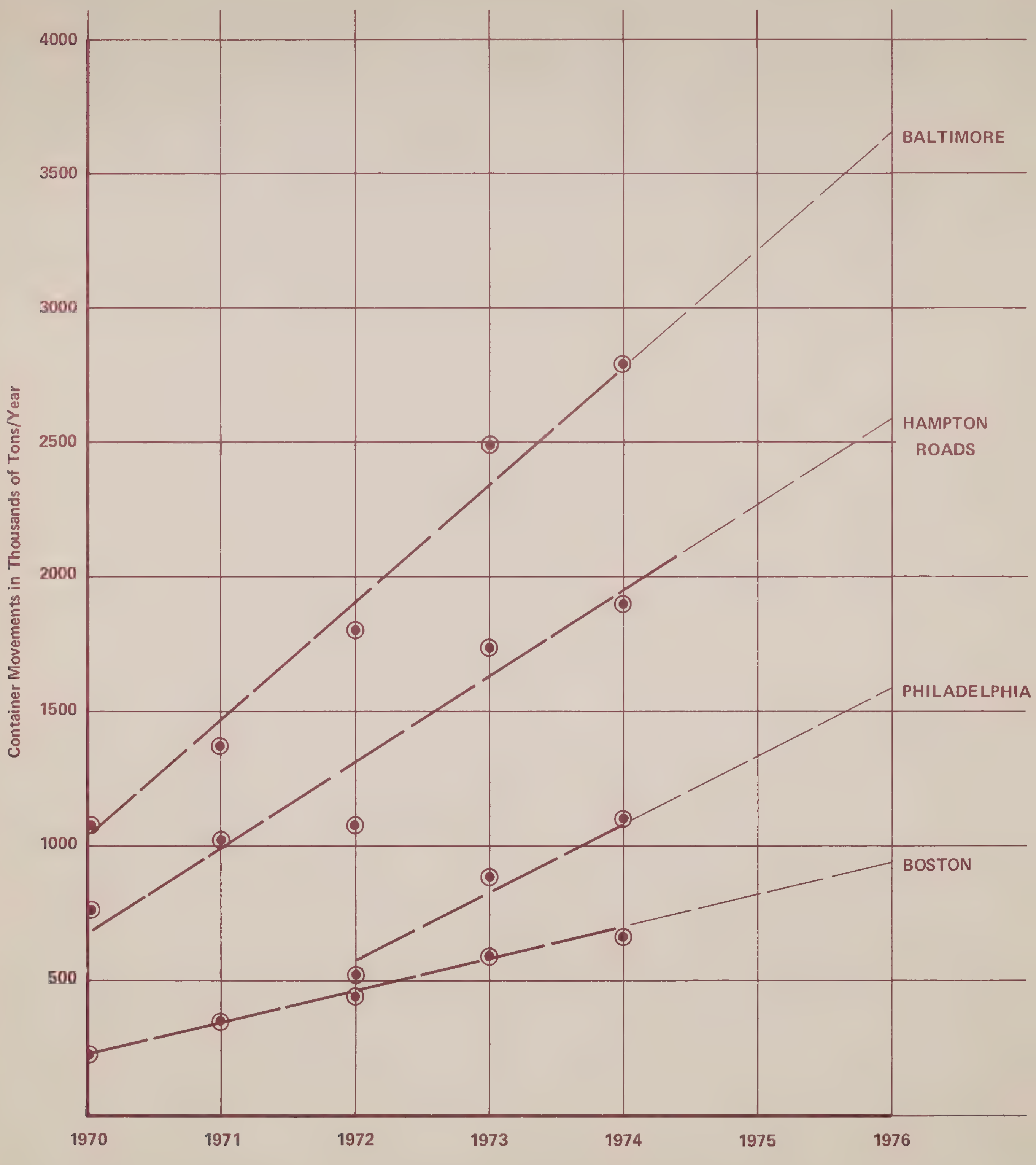


FIGURE 2
CONTAINER MOVEMENTS IN TONS/YEAR (thousands)

CONTAINER MOVEMENTS THROUGH NORTH ATLANTIC PORTS

Growth of container movements through North Atlantic ports in recent years has continued at a rate consistent with the rate in the second half of the nineteen sixties. In the two years between 1972 and 1974, the total number of containers (in 20' equivalents) moving through U.S.N.A. ports increased from 1,092,000 to 1,916,000 full containers. Over 75% of these were in foreign trade with the remainder moving in coastwise trade. At the same time the total amount of containerized cargo increased from 12,560,000 short tons (ST) to about 20,412,000 ST. In other words, the number of containers handled in these ports increased during this recent period at an average rate of about 43% while the containerized cargo handled increased by about 39.5%. Table 2 presents summary statistics of the performance of U.S.N.A. ports as well as data on competing Canadian ports.

It is noted that the rate of growth in the period 1972 - 73 was nearly twice as large as that in the period 1973 - 74. The ratio of foreign to coastal movements varied appreciably among ports, with Boston attaining near balance while most of the competing ports operating primarily in foreign trade. Considering the percentage of containerization achieved, we note in Table 3 that the total amount of general break bulk cargo moving through these ports increased from 24.3 million ST in 1972 to 29.2 million ST in 1973, and 31.5 million ST in 1974. The amount of containerizable cargo increased during this period from 22.1 million ST in 1972 to 26.2 million ST in 1973, and 28.2 million ST in 1974. Therefore, while in 1972 only 51.6% of all general break bulk cargo moved in and out of these ports in containers, nearly 65% moved in containers in 1974. Similarly in 1972 only 59.5% of all containerizable cargo actually moved in containers, while in 1974 well over 72% was in containerized trade.

Ports like New York and Hampton Roads (Norfolk - Newport News, etc.) did better than the average both in the percentage of total general cargo that was containerized and in the capture ratio of containerizable cargo actually handled in containers. The main reason appears to be the large proportion of foreign trade handled by these ports as well as the fact that containerization was established in these ports long before this period.

The most important advance was made by Philadelphia which more than doubled its container throughput in these two years.

Table 2
Summary Statistics
Ref. Intermodal World
Container Movements through World Ports
North - East Coast USA

20' equivalents

E = estimate or extrapolated from partial data

Location	Year	Containers Total No. (incl empties)	Originated/ Terminated in Par	Intermodal Inland Movement	Feeder to/ from Other Ports	Deep Sea	Short Sea	LoLo	RoRo	20 ft	35/ 45 ft		Container Tonnage St.		Tonnage Ratio % Exp.	Imp.
Boston	1972	(59,594) 53,889	20,624	2,291	30,974			100					457,803			
	1973	(73,983) 64,354	35,936	3,092	29,647			100					595,000			
	1974E	(73,981) 90,430	39,539	4,393	36,882	55	45	100		35	65	63%	704,000	183	43	57
Hampton Roads	1972	(207,308 185,524											1082,927			
	1973	(278,318) 244,043											1747,253	61		
	1974E	(359,266) 317,256								34	66	72%	1900,000	9	70	30
Baltimore	1972E	211,000	50,200	150,600	10,200								1800,000			
	1973E	242,000	59,040	171,360	11,600								2500,000	39		
	1974E	264,000	67,680	183,120	13,200	95	5	95	5	25	75	20%	2800,000	12	43	57
Phila-delphia	1972	60,778											547,000			
	1973	100,000											900,000	65		
	1974E	124,445				90	10			60	40	15%	1120,000	24		
New York	1972	582,731											8674,103			
	1973	899,398											12303,081	42		
	1974	1130,000											13920,000	13	45	55
Halifax	1972	98,326	983	97,343									1107,202			
	1973	116,405	1,164	115,241									1310,955	18		
	1974	137,000	1,370	135,630				99	1	60	40		1390,000	6	58	42
Quebec	1972	54,427	2,482	51,400	545								685,292			
	1973	63,519	2,914	59,969	636								850,335	24		
	1974	75,000	3,450	70,800	750	99	1	98	2	78	22	80%	1000,000	18	60	40
Montreal	1972	89,455	44,777			100							1248,360			
	1973	117,789	58,944			100							1717,980	38		
	1974	129,568				100		95	5	90	10		1889,778	10	54	46

Table 3

North Atlantic Ports
% Containerization of Break Bulk Cargo
(in 000 short tons)

Port	Year	Handled by		General Break Bulk		% of	
		Break Bulk	Containerized	Containerizable	Total	Total	Containerized
Hampton Roads	1972	1,332	1,082	2,080	2,415	44	52
	1973	1,092	1,747	2,646	2,839	61	66
	1974E	1,022	1,900	2,638	2,922	65	70
Boston	1972	594	457	885	1,051	43	51
	1973	552	595	1,056	1,165	52	58
	1974E	560	704	1,158	1,232	54	59
Baltimore	1972	2,200	1,800	3,529	4,000	45	51
	1973	1,666	2,500	3,846	4,166	60	65
	1974E	1,716	2,800	4,242	4,516	62	66
Philadelphia	1972	755	547	1,072	1,302	42	51
	1973	936	900	1,551	1,836	49	58
	1974E	1,033	1,120	1,866	2,153	52	60
New York	1972	6,929	8,674	13,553	15,603	55	64
	1973	6,877	12,303	17,087	19,180	64	72
	1974E	6,793	13,920	18,315	20,713	67	76
Halifax	1972	801	1,107	1,677	1,908	58	66
	1973	736	1,310	1,746	2,046	64	75
	1974E	654	1,390	1,759	2,044	68	79

DEVELOPMENTS IN CONTAINER SHIPPING

The 72% capture ratio achieved in 1974 in US North Atlantic ports can be marginally improved, although it is generally assumed that an 80-85% capture ratio is the maximum achievable. The question of whether the recent growth in container movement can be sustained arises. It should be mentioned that the growth rate in total container movement in the past was the result of an increase in capture ratio of traditional general break bulk cargo which itself is growing at an average rate of 7 - 9% per year plus the effect of new cargoes attracted to various trades solely because of the availability of containerization. As a result, it is noted that containerizable cargo grows at nearly twice the rate as total general cargo.

On the other hand, certain general cargo will remain non-containerizable, and this accounts for about 14% of general cargo moving in foreign trade and 20% of general cargo moving in coastwise trade. A larger percentage of foreign trade containerizable cargo is containerized than in coastal trade. This is largely due to the fact that coastal container or feeder container shipping is really in its infancy and has severe limitations because of competitive factors both with regard to general cargo shipping and inland transport. The high cost of fuel may make short distance container or ro-ro shipping competitive with competing modes and it is expected, that as a result, a higher percentage of coastal shipping will be handled in containerized form. At the same time increasing numbers of large third generation containerships on dense trade routes to North Europe, Mediterranean, and Far East will make the US North Atlantic an on port trading area with a resulting demand for increased container feeder shipping capacity.

CAPACITY AND DEMAND IN FOREIGN TRADE

Containerizable cargo in foreign import and export trade increased from about 1.162 million 20' container equivalents (or 12.8 million ST) in 1968 to 2.4 million 20' container equivalents (or 25 million ST) in 1974. Table 4 shows that the demand consisted of 772,000 import containers in 1968 and 1,609,000 containers in 1974.

To meet this demand container shipping capacity (annual one way) of 520,000 and 1,480,000 containers was available in 1968 and 1974 respectively (Table 5). Considering a capture ratio of 74% in foreign trade and that nearly 8% of all containers (153,000) moved as deck cargo on general cargo ships (over 120,000 in foreign trade, consisting of 82,000 import and 38,000 export), only 1,142,000 import containers were carried by designated containerships. As a result an average utilization of 77% of containership capacity in import trade was achieved in 1974. Utilization in export trade averaged a dismal 36% for a total average utilization of 56.5%.

Considering ships on order this trend of overcapacity is expected to continue. Obviously, utilization of capacity varies from route to route. It is noted that for example the North Atlantic and Mediterranean trade routes are vastly overcapacitated, while routes such as Far East, Africa, Persian Gulf/India Basin, and Caribbean/South America appear to have marginal capacities. On many of these latter trade routes an unduly large percentage of containerized cargo is still carried by part containerships or as deck cargo on general cargo ships. Although containerizable cargo is expected to continue to grow at rates varying from 8% per year on the North Europe and Mediterranean routes to over 15% per year on routes such as Persian Gulf/India Basin, container fleet capacity is expected to expand at a lesser rate on the dense and presently overcapacitated routes and at a larger rate on the newly developing routes. This is also largely affected by the rapid development of new container terminals on those lesser routes.

By 1980 well of 80% of containerizable foreign trade cargo is expected to be captured resulting in a total foreign trade volume of about 2.96 million containers and a total container volume of 3.80 million containers (0.84 million in coastwise trade).

In 1985 foreign trade containers handled through U.S. N.A. ports will number about 4.6 million and in 1990 about 7 million or 3.6 times the volume handled in 1974.

The continued growth by containerization will be maintained by the introduction of containerization of a large number of pseudo bulk cargoes (such as baled rubber, latex, processed wood, hides, etc.) as well as the increased demand for manufactured goods by newly rich and other developing nations. For example, manufactured goods imports by Persian Gulf nations is expected to grow at a phenomenal 60 – 80% per year for at least five years.

It is, therefore, expected that even with the current recession in most western industrial nations, the

Table 4
*US North Atlantic Import and Export of Containerizable Cargoes in Numbers (000) of 20' Container Equivalents

Trade Routes	1968		1974		1980E		1985E		1990E	
	Import	Export	Import	Export	Import	Export	Import	Export	Import	Export
North Europe	252	139	608	278	920	420	1300	630	1900	900
South Europe/ Med.	95	47	220	100	350	168	560	268	890	430
Far East	179	43	368	94	590	180	944	290	1500	491
Australia/ New Zealand	25	18	52	37	80	52	140	79	210	123
Africa	48	23	69	49	100	76	164	118	259	185
Persian Gulf/ India Basin	40	30	84	64	150	130	250	200	390	315
Caribbean/ South Ameriza	121	90	208	168	350	270	540	420	850	670
TOTAL	772	390	1609	790	2540	1296	3898	2005	5999	3114

*Ref. U. S. Waterborne Commerce 1974

Table 5
Foreign Trade Designated Container Fleet Capacity on Trade Routes with US North Atlantic
(ooo)

Trade Route	Annual One Way Container Trip* Capacity (20' Equivalents) **1975E	**1980E	**1985E	1990E	1980/1975	1985/1975	1990/1975
North Europe	855	*1280	*1730	2250	49	102	163
South Europe/ Mediterranean	335	540	820	1150	61	144	243
Far East	182	290	- 420	555	59	130	204
Australia/ New Zealand	81	120	158	208	48	97	156
Africa	25	45	74	105	80	196	320
Persian Gulf/ India Basin	28	38	56	95	90	180	375
Caribbean/ South America	65	110	165	240	69	153	207
TOTAL	1571	2423	3423	4603	55	119	194

* Annual one way capacity is number of containers available per year in each direction

** Based on existing 1974 fleet plus known fleet additions announced by operators as designated.

*** Projection of

momentum of foreign trade in containerizable cargoes will be maintained; with an increasing shift of movements from trade between industrialized nations to trade between industrialized and developing nations. This trend will cause large new imbalances in containerized cargo movements, though these imbalances will effect Japan and Europe to a larger extent than the USA. To reduce such imbalances we may, in the future see an increase in triangular container shipping trades; with backhaul cargo obtained from third nation ports not necessarily on the primary trade routes.

BOSTON'S ROLE IN FUTURE CONTAINER MOVEMENTS

A number of projections of Boston container cargo flows have been presented in the past. Table 6 shows forecasts derived by CE Maguire (CEM) in 1973 for MPA and by E. G. Frankel (EGF) in 1972 for the BRA. It is noted that these projectsion derived independently are quite similar and within 10% in the number of containers to be handled. Considering the results of the more recent and detailed study presented in the preceding pages, certain changes in the projections must now be incorporated.

Tables 2 and 3 show that Boston lags behind other U.S. N.A. ports in capture ratio and the percentage of foreign trade containers. It also does not attract a comparable rate of growth in total amount of containerizable cargo. This implies that while Boston will be able to continue to maintain a high rate of growth of container movements until it reaches a capture ratio of 70 - 75%, the growth may lag behind that of other U.S.N.A. ports once a limiting capture ratio is reached, because of the lower growth rate of total containerizable cargo.

These effects could obviously be counterbalanced by the introduction of efficient feeder container (or ro-ro) services, which should be particularly advantageous now under conditions of high fuel costs and various inflationary factors. Similarly, Boston may be able to take advantage of the fact that medium distance routes such as those to the Caribbean are expected to grow at a much faster rate than routes to Europe. Such short and medium distance routes may offer unique applications for feeder type container and ro-ro vessels serving a specialized feeder port. While feeder services from major end point container ports (such as New York, Halifax, and Baltimore) are expected to continue to provide 35% or more of the container movements and direct trans-Atlantic or trans-Pacific foreign trade another 45%, short to medium distance routes may, by 1980, provide well over 20% of all container movements.

While this implies that Boston will continue to serve as a "satellite" or feeder port, it may provide specialized facilities and services for small container (ro-ro) vessels which serve feeder and/or short/medium distance trades.

Capacity of U.S.N.A. container terminals is currently projected to run at 230% of demand in 1974 and to reach 250% of demand by 1975. This overcapacity is expected to grow both as a result of increased container terminal investment and the increased average containership sizes using these container terminals. The economy of size also benefits such mammoth facilities as at Port Elizabeth and Baltimore, where concentrations of multiterminals allow very high equipment and berth utilization.

The projections presented in Table 6 are valid for Boston serving primarily as a "satellite" or feeder container port. If attractive facilities, services and prices are provided to attract short/medium distance container

Table 6

BOSTON CONTAINER CARGO FLOW PROJECTIONS

(in thousands of ton (ST) in 20' container equivalents)

	Containerizable Cargo		Containerized		No. Full Containers		Total No. Containers		Facility Requirements	
1973 E	1000	1000	580	580	69600	69600	80800	82000	100000	
1974	1060		636		76000		87400		110000	
1975	1132	1200	702	800		80000		92000		
1976	1205		771		92000		105800		132000	
1977	1280		845							
1978	1355		921		109000		125400		156000	
1979	1433		1003		128000		148200		185000	
1980	1517	2080	1073	1400	128000	140000	148200	158000	185000	
1981	1559		1123							
1982	1607		1174		140000		161000		201300	
1983	1657		1226							
1984	1707		1280		153000		176000		22000	
1985	1758		1336							
1986	1809		1384		165000		189700		236400	
1987	1862		1434							
1988	1915		1484		179000		207000		259000	
1989	1970		1536							
1990	2025	2480	1589	2000	189000	200000	217000	233000	271300	
	CEM	EGF	CEM	EGF	CEM	EGF	CEM	EGF	CEM	EGF

Table 7

Port of Boston - Growth of Containerizable Cargo and Container Tonnage

Year	Total Containerizable Cargo	Tons Containerized	Annual Growth	% Containerizable Via Container	Number of Containers (TEU's)	Annual Growth
1967	775,131	N/A		N/A	N/A	
1968	768,488	N/A		N/A	N/A	
1969	603,547	17,934		3.0%	2,135	
1970	733,995	222,264		30.3%	26,460	
			60.3%			60.5%
1971	778,578	356,318		45.8%	42,472	
			28.5%			40.3%
1972	885,100	457,800		51.7%	59,642	
			30.0%			24.0%
1973	1,000,000	595,000		58.0%	73,981	
1974*		704,000	18.3%		90,430	15.3%

*All 1974 entries are estimated on basis of first 8 months of 1974.

Number of Containers Handled by the Port of Boston

	Moran				1972				1973				1974*			
	Sea-Land	Docks	Others	Total	Sea-Land	Docks	Others	Total	Sea-Land	Docks	Others	Total	Sea-Land	Docks	Others	Total
Inward	7,981	802	13,921	22,704	19,863	10,747	4,555	35,165	18,816	20,880	3,772	43,468	17,906	27,640	2,636	48,182
Outward	6,549	348	12,871	19,768	11,110	9,851	3,516	24,477	9,508	18,385	2,620	30,513	13,728	27,360	1,160	42,248
Total	14,530	1,150*	26,792	42,472	30,973	20,598	8,071	59,642	28,324	39,265	6,392	73,981	31,634	55,000	3,796	90,430
Percent of Total	34.2%	2.7%	63.1%	100%	51.9%	35.1%	13%	100%		53.1%	8.6%	100%	35.5%	60.8%	4.2%	100%

* Estimated Based on 8 months

Moran Total % Containers	1971	1972	1973	1974
in	70%	52%	53%	50%
out	30%	48%	47%	50%
% Full Containers				
in			60%	52%
out			40%	48%
% Empty Containers @ Moran				
empty			13.7%	
full				7.3% (first 8 months)

Vessel Arrivals

1970	1971	1972	1973	1974 (est.)
46	74	163	244	290

shipping, then demand may well be 10 - 20% above the forecast of Table 6. Such facilities may include efficient ro-ro berth as well as freight stations for pseudo bulk cargoes such as sugar, molasses, processed wood and others.

Considering the developments of container movements through the Port of Boston presented in Table 7, it is noted that actual numbers of containers handled in 1973 and 1974 are within 10% of the forecasts made in 1969 and 1972, respectively. The growth of container movements continues albeit at a decreasing rate of growth. Current economic conditions may obviously affect trade significantly, yet, it is generally believed that U.S. manufactured exports will increase and more than affect any decrease in manufactured imports.

Other considerations include the growing use of containers (including tank and pallet containers) for the carriage of pseudo bulk cargoes such as baled rubber, finished hardwood, lumber, textiles, paper products, paints, solvents, etc. The U.S. is also expected to greatly increase its export of processed foods, all of which are containerizable cargoes. The question obviously arises how such developments affect the container trade of the Port of Boston. An increasing percentage of the manufacturing output of industries in the hinterland of Boston is consumer and export oriented versus defense and U. S. Government. Although the scope of this brief study does not permit a detailed analysis of this trend, perusal of Department of Commerce manufacturing and trade figures for 1974 (preliminary) indicate, that by 1976 well over 68% of the output (by value) of the manufacturing industries of New England will be in civilian goods of which as much as 30% may be for export. This would imply an increase in containerizable export through the Port of Boston of at least 12% per year cumulative for the period 1974 to 1976 which is expected to be larger than the projected decrease in the growth rate of containerized imports.

The most important factors are Boston's participation in feeder, coastal and short-medium distance foreign trade. The take over of U.S.-Puerto Rico shipping by a publicly owned shipping corporation in Puerto Rico as well as the restructuring of the U.S.-Caribbean and intra-Caribbean trade offers opportunities for Boston to attract direct service to this important trading area.

Similarly, there are growing opportunities in coastal and feeder trade, as well as in low density international trade. Increasing containerized export of high value cargo will attract container imports as back haul or direct delivery cargo. Some of this will be seasonal such as citrus from Mediterranean countries; other, may be year round pseudo bulk or manufactured goods. Considering these and other factors, we now expect the growth of container movement through the Port of Boston to be as presented in Table 8.

Comparing these results with those of earlier projections (Table 6) it is noted:

> The rate of growth of containerizable cargo movements in tons is expected to be similar to that projected in the earlier studies.

Table 8

Updated Container Cargo Projections

Port of Boston

(in thousands)

Year	Containerizable	Containerized		No. of Containers		
	(tons)	tons	%	Full	Total	% Full
1973 Actual	1026	595	58	64.35	73.98	87
1974 Est.	1193	704	59	78.93	90.40	87
1975 Est.	1268	761	60	84.55	96.07	88
1976 Est.	1319	805	61	89.44	100.49	89
1977 Est.	1400	868	62	96.44	107.15	90
1978 Est.	1476	930	63	103.33	113.51	91
1979 Est.	1531	980	64	108.88	119.56	91
1980 Est.	1612	1048	65	116.44	129.38	90
1981 Est.	1654	1092	66	121.33	134.81	90
1982 Est.	1704	1142	67	126.88	142.56	89
1983 Est.	1794	1202	67	133.55	150.05	89
1984 Est.	1841	1252	68	139.11	156.30	89
1985 Est.	1889	1285	68	142.78	160.42	89
1986 Est.	1942	1340	69	145.90	165.79	88
1987 Est.	2023	1396	69	149.94	170.38	88
1988 Est.	2067	1447	70	156.28	179.63	87
1989 Est.	2187	1531	70	162.40	186.66	87
1990 Est.	2293	1628	71	168.02	193.12	87

- The density of the containerized cargo is expected to increase by 10% over the next 15 years as a result of a larger proportion of higher density pseudo bulk cargoes in containerized trade.

- The percentage of containerized cargo is expected to level off at 71% and not attain the level of larger container ports because of the size distribution of consignments with a smaller than average unit consignment, resulting in a very large number of less than full container loads.

- The percentage of full containers is expected to raise from 87% now to 91% by 1978, but then fall again to 87% towards the end of the next decade as the imbalance of exports to imports continues to grow.

- Major recapture of Boston imports/exports currently shipped through other ports is not expected. It is assumed that by 1990 nearly one million tons of such cargo will still move through other ports.

It should be mentioned that the above projections are based on the assumption of price and service competitiveness of Boston with other U.S.N.A. ports as well as continuous aggressive marketing by the port. It also assumed the absence of prolonged strikes or other impediments to effective service, and that the settlement of the December 1974 strike would not seriously affect the Port's competitive posture.

The reacceptance of Boston as a port of call on international routes is a recent development and as yet, based on fragile commitments. Most operators have alternatives and contingency plans which could be implemented within a short time and which may, in some cases, result in unretrievable loss of cargo movements if the port cannot provide reliable, efficient, and price competitive service.

Regarding the above projections of Boston container traffic, it must also be mentioned that the growth rates assumed are appreciably less than those generally projected for more developed container ports such as New York, Baltimore and Norfolk. The growth in container terminal expenditures in U.S.N.A. ports is planned to continue with budgets for 1973-77 of $258 million, compared to expenditures for 1966-72 of $192 million. These budgets, most of which are finally committed by equipment contracts, are the best testimony of develments expected by port managements.

2 FACILITY REQUIREMENTS

INTRODUCTION

Facility requirements vary widely and cannot be assumed to be a simple multiple of the expected number of containers handled. Facility capacity requirements designed to meet a projected demand of container throughput must be expressed both in terms of facility and demand characteristics and are a function of:

Demand Particular

- Distribution of number of ship calls over time and number of ships seeking service at any period in time.
- Distribution of ship size and number of containers loaded/unloaded at a call at Boston.
- Distribution of percentage of import to export and full to empty containers per ship call and per unit time. Similarly, the relation of stuffing/unstuffing to full container loads affects facility requirements.

Facility Particular

- Layout of facility.
- Number of berth and berth characteristics.
- Storage area and methods of container handling and stacking (storing).
- Container cranes, portainers and other mobile equipment.
- Transfer methods to and from inland transport. Circulation, access, marshalling of inland transport.
- Distribution of terminal storage time. Accessibility requirements. Free time. Location of freight (stuffing/unstuffing) station.
- Control of operations.
- Work rules and productivity.

The above and other factors result in large variations in achieved and achievable throughput as well as degrees of congestion among facilities with supposedly similar capacities. It is therefore difficult to compute or quote a specific number as representing the facility requirements or capacity.

The number of ship calls at Boston is expected to increase from 290 in 1974 to 460 by 1980 and 620 by 1990 and these by past experience follow a random arrival pattern with an exponential time between arrivals and an average time along a container terminal berth of about 23 hours (including docking/undocking). Using simple queuing theory, we derive that with only the three existing berths (assuming Moran to be a two berth facility), there in 1980 is a 36% probability that an arrival will have to wait, with an average waiting time of 15 hours. By

1990 the probability of waiting will have increased to over 50% with an average waiting time of 22 hours. The above assumes operations 7 days a week and constant turn around at the berth averaging 23 hours per containership. This implies that a fourth berth will be required by about 1980 and a fifth berth by 1990 to reduce the probability of waiting to an acceptable 20% maximum, with an average waiting time not exceeding 10 hours.

Berths should have a length of 800'-900' for single marginal berth, 1500'-1600' for double marginal berth and 2200' for a triple marginal berth to accommodate the distribution of containership lengths expected in Boston. Considering that only 10% of the containership calls are expected by ships with length exceeding 800' in 1975, 20% in 1980 and 30% in 1990, the above probabilities of waiting apply. The probability of two or more very large containerships in port simultaneously is very small indeed.

Storage capacity requirements are estimated at 3000 containers by 1980 rising to 5600 by 1990. This assumes no change in the average in port storage time (1 week) of both full and empty containers as well as the proportion of port container loads handled through the port. Depending on stacking arrangements and facility layout, this implies a combined storage area requirement of 36 - 42 acres in 1980 growing to 50 - 60 acres by 1990.

The projected total number of containers to be handled by the Port in 1990 is estimated at 193,000 TEU's as shown in Section 1. This number should be increased by a 25% allowance for peaking to determine total facilities required. Thus, the recommended facility requirements to meet the 1990 demand projections should be based on a total of 241,000 TEU's. It should be noted here that the difference between this projection and that of earlier studies reflects current statistics showing increased density of container contents; that is while the projected total tonnage handled has increased slightly, the projected number of containers has decreased.

EXISTING FACILITY CAPACITIES

Mystic Terminal - The maximum practical operating capacity of the present Mystic Terminal with its 22 acres and 1100' berth is estimated to be 60,000 TEU's annually.

Castle Island - The maximum operating capacity at the existing Sea-Land Container Terminal with its 13 acres and 600' berth as currently operated is estimated to be 35,000 TEU's annually. As noted in CEM's earlier report, the current operating capacity is based on a one ship per week schedule and does not represent maximum utilization of the berth, crane and backland.

ADDITIONAL REQUIREMENTS

It can be seen from the above that 146,000 TEU's remain to be handled by additional facilities in order to meet the 1990 demand projections. The remaining sections of this report will discuss ways to meet that demand.

MYSTIC WHARF — MORAN TERMINAL

CASTLE ISLAND — SEA-LAND TERMINAL

3 EXPANSION OF EXISTING FACILITIES

CASTLE ISLAND

Overview

The Castle Island Port Terminal at the mouth of Boston Harbor in South Boston is entirely owned and partially operated by Massport. Of the approximately 101 total acres at the terminal, approximately 54 acres of berth and storage area are leased to private operators for the movement of containers, automobiles, cement and fuel oil. The remaining space is operated by Massport as a public terminal for the movement of general cargoes, including substantial lumber imports.

Castle Island is immediately adjacent to both the main shipping channel and the Reserved Channel. The main channel is 1,200 feet wide, and is maintained to depths of 35 feet on the inboard half and 40 feet for the outboard run. An area north of the main channel is available for use as a turning basin. The Reserved Channel is only 600 feet wide and is maintained at a depth of 35 feet, but dredging operations authorized for early 1975 will create a depth of 40 feet.

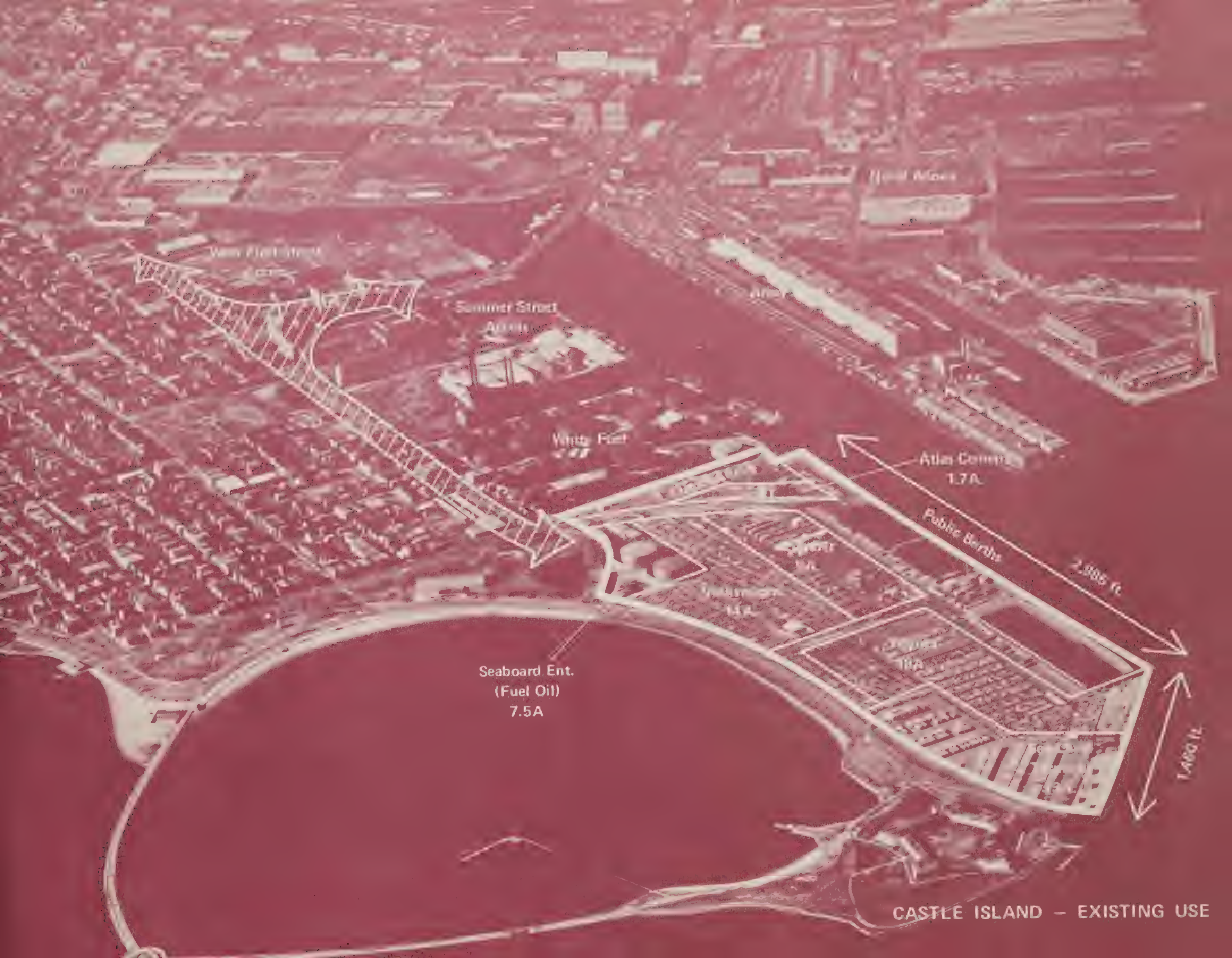
Truck access routes for Castle Island have been discussed in previous reports. If Northern Avenue were used there would be a need to replace the existing bridge across the Fort Point Channel. This bridge at present has a 15 ton limie and a replacement is under design. Access onto Northern Avenue is by way of the Commonwealth Pier viaduct and ramp which at best is a poor route. A possible alternate might be through the present Naval Annex site, but this is dependent upon the future development of the site. This could connect with the City's proposed Seaport access road. If trucks were routed down Summer Street the existing bridge would have to be replaced. It now has a 12 ton limit. All the above routes will place trucks in the heavily congested South Station and Atlantic Avenue area. Road connections to all areas are available here, but traffic conditions are poor at present.

The route by way of First Street to Broadway is poor with narrow streets and heavy congestion near the Broadway Bridge where there is an MBTA station in the middle of the street with its accompanying heavy pedestrian traffic. The route also passes through residential areas along Broadway.

Access to the regional rail network is only fair. The Penn Central Railroad provides local access to its South Boston yards (about 1.4 miles away) which then connects directly with the Dorchester-Shoreline route to the south. However, rail movements to the north and west require circuitous switching to the B&M Railroad system.

Existing Terminal Use

The Sea-Land Container Terminal as shown on the accompanying plate presently leases 13 acres of land, including one 600' berth, in the southeast corner of the site, and a 26 ton container crane all owned by Massport. Sea-Land's lease agreement



CASTLE ISLAND – EXISTING USE

gives them exclusive use of those facilities through 1991. All containers through Sea-Land's terminal are trans-shipments to and from their major terminal at Port Elizabeth, New Jersey. Containers are presently stored on chassis in the backland with space for 275 containers. Sea-Land pays $15,493.34 per month for the land and berth and $8,854.17 per month for the crane to Massport, totalling $292,170. per year in lease payments.

The Toyota Automobile Terminal leases 18 acres of the Castle Island Terminal, including one berth, in the central and northeast portions of the site as shown. Their terminal is used for the importation and temporary storage of automobiles. Toyota has exclusive use of that berth, however Massport may arrange alternate use when the berth is not being used by Toyota by paying one-half of Massport's revenues from that use to Toyota. A clause of Massport's lease with Toyota allows Massport to relocate their operation to any suitable site in the harbor at any time. The Toyota lease runs through 1986, and provides Massport revenues of $100,000 per year for the 15.2 acre land area and $100,000 per year for the 2.8 acre berth area.

The Volkswagen Automobile Terminal leases 14 acres in the southwest portion of the site for the storage of imported autos. Import ships for Volkswagen use any of the public berths along the north edge of the site upon payment of wharfage and dockage tariffs (totaling $1.05 per auto) to Massport, or the Toyota berth subject to the arrangements mentioned above. Volkswagen's lease also contains a clause allowing Massport to relocate their operation to another suitable site at any time. Massport received $7,166.66 per month, or $86,000 per year, for lease of the land area under agreement through 1981.

Volkswagen or Toyota can rent additional land area, when available at the Terminal, at a rate of $1.90 per auto and $0.30 per auto per day.

Seaboard Enterprises presently leases 7.5 acres in the southwest corner of the terminal for the storage and distribution of fuel oils. They seldom, if ever, use the Terminal berth areas, however the abutting land owner, White Fuel, uses pipeline loading and unloading equipment at berth #11 (west end) on occasion but with last priority. Seaboard's lease runs through 1984 with options to renew to 1996 and provides $2,864.45 per month, ($34,375 per year),. in rental payments to Massport. Their terminal contains substantial investment in oil tanks, distribution and loading equipment.

Atlas Cement presently leases 1.7 acres in the northwest area of the site for the import, storage and distribution of dry Portland cement. Their lease runs through 1991*and provides $12,000 per year in land rental plus $833.33 per month guaranteed in lieu of wharfage and dockage, both totalling $22,000 per year. Atlas also has significant capital investment in storage tanks and handling equipment.* including options

The Massport Public Terminal (Lumber Operations) operates a substantial portion of the public terminal for

the import of lumber for various regional lumber distributors. Revenues accrue from wharfage and dockage tariffs to ships, and usage, storage and handling charges to shippers, totalling $7.30 per thousand gross board feet (MGBF). Two areas are set aside for lumber storage at the terminal - a 9 acre parcel in the central part of the site and a 6 acre parcel along the west boundary.

The remainder of the Castle Island Terminal is operated as a public general cargo facility by Massport. This includes a storage shed (± 2 acres) used for newsprint, pulp and paper, a transit shed (± 4.5 acres) used for indoor storage and throughput loading to trucks, and an outdoor area (± 5 acres) used primarily for storage of containers shipped as deck cargo on various ships. Revenues from wharfage, dockage, usage, storage and handling vary widely depending on the type of cargo.

Massport's total gross and net revenues from Castle Island operations for the last two fiscal years are the following:

	1972-73	1973-74
Gross Revenue	$1,757,736	$1,698,748
Net Revenue	1,120,959	1,037,545
% Net of Gross	63.8%	61.1%

The gross revenues for the calendar year 1973 can be summarized approximately as follows:

Sea-Land Container Operation		
Land and Berth Rental	$185,920	
Crane Rental	106,250	
		$292,170
Toyota Auto Operation		
Land Rental	$100,000	
Berth Rental	100,000	
		200,000
Volkswagen Auto Operation		
Land Rental	$ 86,000	
Wharfage & Dockage Tariffs	31,230	
		117,230
Seaboard Enterprises		
Land Rental		34,375
Atlas Cement		
Land Rental	$ 12,000	
Guarantees	10,000	
		22,000
Lumber Operations		
Wharfage, Dockage, Usage, Storage	$135,503	
Handling	430,142	
		565,645
Other General Cargo Operations and Miscellaneous Fees		468,580*
		$1,700,000*

* Data was not immediately available for general cargo tonnages, miscellaneous fees, or the total gross revenue for the calendar year 1973. An estimate of total gross revenue ($1,700,000) was made from actual fiscal year values. The estimate for general cargo and miscellaneous revenue was obtained by subtracting known revenues from the estimated total.

It is significant to note that lumber and general cargo operations make up the bulk of Massport's gross revenues at the Castle Island terminal. This is, to some extent, related to the fact that Massport provides the handling service for these movements, and not for the container or auto cargoes. If, however, the cost related to providing these services is subtracted, the lumber and general cargo operations still provide over 50 percent of total net revenues for Massport but use only 30 to 35% of the land area at the terminal.

Auto operations provide 20 - 25% of net revenues but use about 32% of the land area. Sea-Land's container operation provides 20 - 25% of net revenues on only 15% of the terminal land area.

Major cargo movements through the Castle Island Terminal in recent years is summarized in the following table:

CASTLE ISLAND TERMINAL

CARGO MOVEMENTS

	1969	1970	1971	1972	1973
Lumber (MGBF)	N/A	N/A	92,969	95,610	77,503
Toyotas (ea.)	7,040	11,698	21,220	20,469	17,830
Volkswagens (ea.)	25,818	37,175	31,869	25,452	29,742
Other Autos (ea.)	1,589	2,653	1,980	1,274	372
Sea-Land Containers (TEU)	N/A	N/A	14,530	30,973	28,324

N/A = Not Available

Expansion Potential for Container Operations

Expansion of container handling capability at Castle Island will require resolution of problems associated with three constraints which vary in significance depending on the development scheme pursued:

1. the intrusion of container cranes and ship masts into the Logan Airport approach zones.
2. the relocation of existing cargo activities to suitable alternate sites within the harbor.
3. the renegotiation of Sea-Land's lease to allow joint use of the crane and berth presently exclusively used (but under-used) by Sea-Land.

The approach slope to runway 4R at Logan Airport passes approximately 71 feet above the public wharf. The FAA was requested to informally evaluate whether or not a low profile container crane, approximately 100 feet high, would be permitted along the wharf. Even though such a crane would penetrate the 50:1 approach slope by approximately 29 feet, FAA felt it would probably be permitted although this is a reversal of their earlier opinion. The previous negative opinion had weighed heavily against this site and was the major reason for rejection. The apparent willingness by FAA at this time to consider allowing such an intrusion is the basis for our recommendation that formal application be made at once by Massport to FAA to resolve this issue. In addition, intrusion of ship masts which can exceed the crane height, although not considered according to FAA in their evaluation must also be approved. Massport itself, as operator of the airport, may have objections to any obstructions in these approach zones.

The relocation of existing cargo operations at the terminal is likely to be the most significant obstruction to the development of expanded container facilities in that this relocation is necessary for the implementation of any of the alternate development schemes. Relocation of the Toyota and/or Volkswagen auto operations appears to be the easiest to implement. Massport has the ability, through the lease clause previously mentioned, to relocate these operations to another suitable site. Possible sites include:

- the Army Base, assuming the necessary disposition can be obtained from GSA. This site, however, has insufficient outdoor storage space and indoor storage will result in increased handling costs according to a preliminary evaluation by Massport's General Manager at Castle Island.
- the Naval Annex, where less than optimum storage space could be obtained, assuming a "higher value" user for some portion of the site could not be found by GSA, the state, or the city.
- the East Boston Massport Terminal, a site which Toyota has negotiated lease agreements for in the past and is apparently still willing to consider.
- an inland storage site, which is rejected because of the significantly higher handling expense and operational difficulties of the extra transfer from berth to storage area.

Relocation of lumber operations will present added difficulties in that the lumber shippers are unwilling to move to the north side of the harbor (e.g. East

Boston) because their market orientation is to the south and west. Possible relocations to the Army Base or Naval Annex, subject to the above-mentioned constraints, appears to warrant further study. The significant revenues obtained from lumber operations are such that Massport must insure satisfactory relocation arrangements to avoid the risk of losing lumber operations to another port.

Relocation of general cargo handling facilities to the Army Base, Naval Annex or elsewhere would appear not to present significant difficulties, subject to the future disposition of these lands.

Relocation of Atlas Cement and Seaboard Enterprises is likely to require some reimbursement by Massport for relocation of tanks and equipment if lease arrangements are broken before termination.

Other factors involved in the assessment of relocation impacts, which are difficult to specify at this time, are the likely increase in lumber imports once the housing market, now artificially depressed, becomes more favorable for construction, and the likely decline in the import of foreign autos due to dollar devaluation and the possible increase in import taxes as the federal government attempts to boost the sagging domestic auto market.

Negotiations with Sea-Land for use of their berth and crane may be difficult. Sea-Land's operation is predicated on high efficiency feeder service for their own containers, allowing them complete control over handling and scheduling. While they would still have priority use of the facilities the risk of costly delays due to public terminal joint use may be seen by them to offset any savings they may receive from a renegotiated lease agreement. On the other hand, Sea-Land's crane is apparently unused 4-5 days out of a week on the average, and this appears to be economically inefficient from both their point of view and Massport's.

Expansion Alternatives

A great number of development schemes, as well as combination of schemes, are possible at Castle Island and can be evaluated based largely on the significance of the above-mentioned constraints relative to each. While no attempt will be made to discuss all possible combinations the following is a description of alternatives:

The development alternatives fall into two major categories: 1) those based on berthing at the east wharf facing the main channel and 2) those calling for container operations along the Reserved Channel.

1. Development Along The Main Channel (east wharf)

The total length available along the main channel face of Castle Island is some 1,460 feet. Of this, the Sea-Land Terminal occupies 600 l.f. of berthing space. Another 600 foot berth immediately north of the Sea-Land Terminal is currently leased by Toyota for off-loading of automobiles. The remaining 260 feet, located immediately to the south of the Sea-Land berth are owned by Massport but not developed. This latter section abuts the fort

on Castle Island and, because of a skewed boundary line, provides no direct access to adjacent backland. It provides space for mooring lines and Sea-Land vessels and thus permits full use of Sea-Land's 600 foot wharf length that is not used for other purposes. The alternatives along this entire frontage are:

1a. Relocation of the Toyota operation to another site, use of a portion of the existing transit shed for stuffing and stripping, and joint use of Sea-Land's berth and crane.

This alternative represents the minimum cost development. It provides additional storage area for maximization of the use of Sea-Land's crane and berth but with joint use by a public terminal. While it is considered very unlikely that Sea-Land would be willing to renegotiate the terms of its lease to permit joint use, the situation should be explored further by Massport.

Additional land area provided (18 from Toyota, 3 from shed)	21 acres

The facility will still be a one berth terminal, therefore the increase in capacity will be sufficient only to attain high capacity use (70,000 TEU) of the berth.

Additional Capacity (over and above Sea-Land's 35,000)	35,000 TEU

Development cost for this alternative will include repaving of 15 acres with high strength pavement, minor improvements to the transit shed, construction of a scale house and 3 scales and fencing.

Estimated Development Cost $1,850,000*

Another cost not considered in the above is the reduction in Massport revenues resulting from renegotiation of Sea-Land's lease for joint use. Massport's revenues from Sea-Land are likely to decrease by approximately $100,000 per year. Massport will also lose $200,000 per year from Toyota's lease at Castle Island; however, it is assumed that this would be recovered by lease at an alternate site. The gross lease revenues from relocation of Toyota (or any other) facility might be partially offset by any costs to Massport (e.g. acquisition, demolition, etc.) incurred in such a move.

* All development costs in this section are based on construction cost estimates projected to 1977.

1b. Same location and land area as alternative 1a except development of Toyota's wharf as a separate container berth with a new crane without joint use of Sea-Land's facilities.

This alternative will involve the same added land area as 1a. but would require FAA approval for air space intrusion of the container crane.

Additional Land Area 21 acres

The added capacity will be that associated with independent operations of a one-berth container terminal with sufficient backland. However, the berth length of 600' is a severe deterrent to use by larger ships. They would either have to overlap into the Reserved Channel or into Sea-Land's berth. This would be awkward however since Sea-Land's ships are already overlapping onto Toyota's berth at certain times. Therefore, additional capacity is less than that for a normal facility.

Additional Capacity (over and above Sea-Land's 35,000) 60,000 TEU

Development costs in addition to those of alternate 1a. include reconstruction of the wharf to required load capacity, a new low-profile crane, and 3 additional scales.

Estimated Development Cost $9,800,000

Development of an additional 200'± of the waterfront area immediately to the south of the Sea-Land Terminal might ease this overlap situation slightly. However, it would provide only an additional 100 feet or so for the public terminal (increasing it from 600 feet to 700 feet). This would not yield a significant increase in capacity and is judged not to be worth the additional $3 - 4 million in construction costs that would be required.

1c. This alternative involes construction of a new one-berth facility at Toyota as well as joint use of Sea-Land's berth and the use of the current Volkswagen storage area.

The 21 acres of additional storage area from Toyota would be insufficient to serve the 2-berth facility to optimum capacity. Taking the Volkswagen storage area of 14 acres would provide the required additional storage area.

Additional Land Area 35 acres

The capacity, however, will not be average for a two-berth facility becuase of the limited length of both berths. A reduction in the capacity of each to 60,000 TEU per year seems appropriate.

Additional Capacity (over and above Sea-Land's 35,000) 85,000 TEU

Development costs will be the same as for 1b. with the addition of repaving the Volkswagen area.

Estimated Development Cost $11,000,000

2. Development Along The Reserve Channel

The lineal footage of Castle Island's waterfront along the Reserve Channel is 2,985 feet. The following alternate development schemes represent the range of possible container expansion along this frontage.

2a. Construction of an independent one-berth facility at the existing storage shed No. 2.

This scheme would provide an optimum one-berth facility if the Volkswagen storage area were relocated, the storage shed removed and the area paved, general cargo operations in and alongside the shed relocated, and the 9 acre lumber storage area moved to the rear of the site along Day Boulevard. Toyota's land would not be needed. This scheme would require FAA approval for air space intrusion.

Acreage provided would be 6 acres from berths 12 & 13 (1200') in front of the shed, 14 acres from the Volkswagen area (after 9 acres are traded for relocation of the lumber storage area), 10 acres from the demolished storage shed, land alongside and part of the transit shed No. 1.

Additional Land Area	30 acres

Capacity, because of the 1200' berth length and excellent orientation of backland relative to the berth, would be 80,000 to 90,000 TEU's for the one berth facility.

Additional Capacity (over and above Sea-Land's 35,000)	85,000 TEU

Development costs include reconstruction of the wharf, new crane, repaving of approximately 20 acres and construction of a scale house and 6 scales.

Estimated Construction Cost	$15,500,000

2b. Construction of an independent one-berth facility opposite the Atlas Cement property.

The advantage of this scheme over that of scheme 2a. is that the crane would be outside the air space reserved for aircraft approach and construction would not require formal FAA approval. A disadvantage is that Atlas Cement must be relocated with reimbursement for relocation of tanks and equipment.

Land area requirements would necessitate the relocation of Volkswagen and Atlas Cement to alternate sites and the moving of both lumber storage areas to the existing Volkswagen storage area. Land area resulting from these relocations, demolition of storage shed No. 2 and use of part of the other shed for stuffing and stripping will be:

Additional Land Area 35 acres

Added capacity would be the same as that for 2a. (i.e. 85,000 TEU).

Development costs would be 1-2% higher than 2a because of relocation of Atlas tanks and equipment.

Total Additional Capacity (over and above Sea-Land's 35,000) 85,000 TEU

2c. Construction of an independent two-berth facility on the Reserve Channel.

This scheme would entail development of a full two-berth facility, some 2,200' in length, running westward from the mouth of the Reserve Channel. It would involve the relocation of the Toyota, Volkswagen and lumber operations, as discussed under alternates 1b. and 2a and 2b, demolition of the remaining portion of Shed No. 2 and of part of Shed No. 1 (with remainder used for stuffing and stripping operations).

Additional Land Area 50 acres±

The backland and berth configuration and the length of wharf permitting 2 large vessels or 3 smaller ships to be handled simultaneously would yield a capacity reflecting nearly optimum throughput.

Additional Capacity (over and above Sea-Land's 35,000) 175,000 TEU

Development costs would include reconstruction of the wharf, 3 new low profile cranes, repaving, demolition and related facility construction.

Estimated Development Cost $33,000,000

3. Development of the Entire Castle Island Peninsula

Development of all of Castle Island as a public container terminal, with the exception of Sea-Board Enterprises' property and Sea-Land's existing terminal.

This alternative is discussed only with respect to the potential long range capacity of Castle Island as a container terminal which, as will be shown, can provide capacity for demand projections well beyond the year 1990. All existing operations, with the exception of the two mentioned above, will have to be relocated to other sites in the harbor.

Available Land Area	80 acres
Available Berth Space	3,600 feet

Both storage sheds should be removed and new administrative and stuffing/stripping facilities located at the rear of the new terminal away from the wharf face.

Of the 3,600 feet of available berth length the 3,000 feet along the Reserved Channel would be adequate for the 3 berth facility. The remaining 600 feet along the Main Channel could be used for smaller ships with or without a dockside container crane.

Total Additional Capacity (over and above Sea-Land's 35,000)	250,000 TEU

It is inappropriate, at this time, to estimate development costs or expected revenues for this long range scheme.

MYSTIC WHARF

Overview

Mystic Wharf is a peninsula of land in Charlestown between the Mystic Channel and Little Mystic Channel bounded at one end by Wiggins Terminal and at the other by Mystic Pier No. 1 and Piers 48, 49, and 50. Of the 82 acres at the wharf (excluding the BRA park along Little Mystic Channel), 25 acres are owned by the U.S. Gypsum Company, the Boston & Maine Railroad and Wiggins Terminal. The remaining 57 acres are owned by Massport.

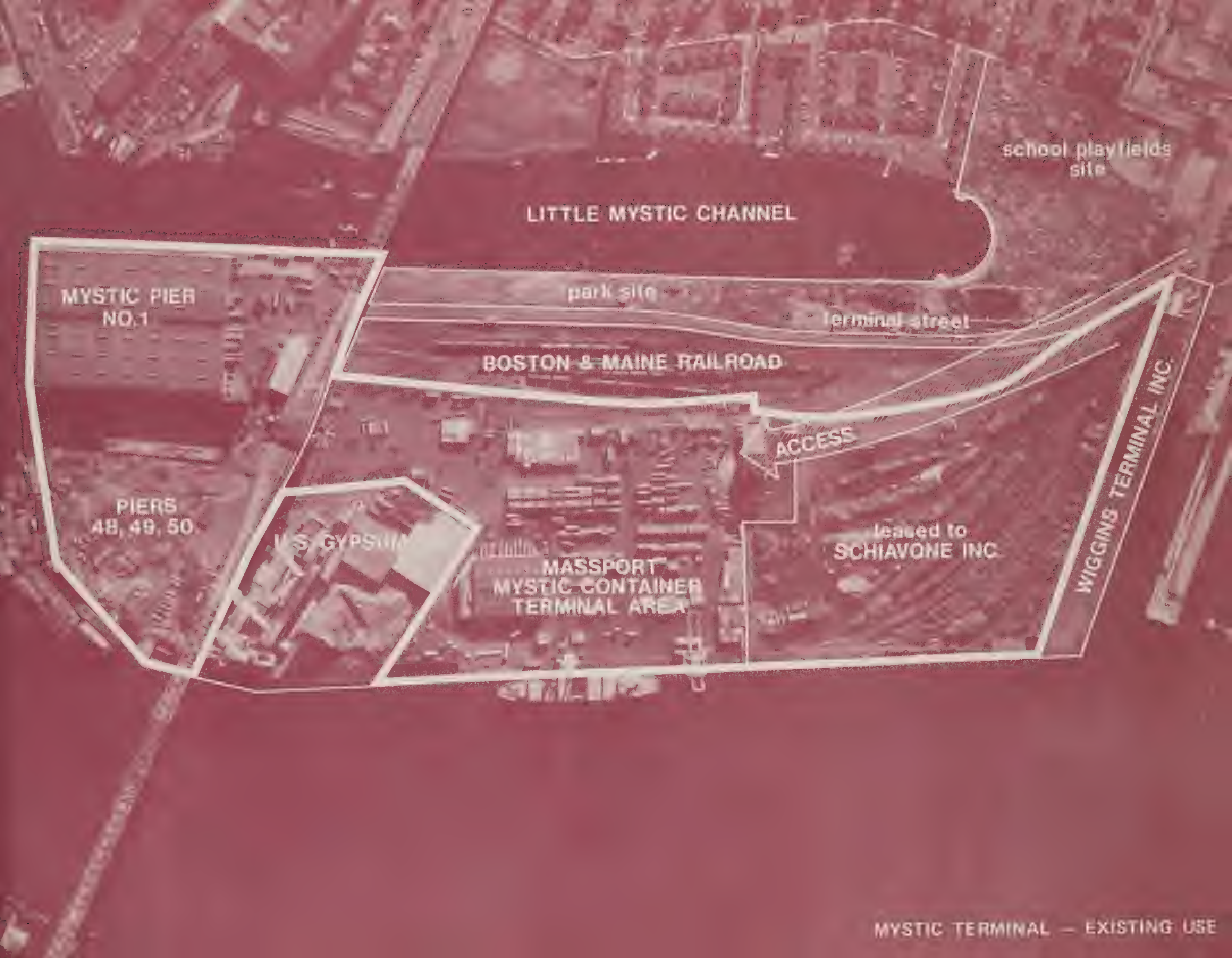
Of all the sites being considered the Mystic Wharf area is located farthest from the open ocean, approximately four miles from the mouth of the Inner Harbor. It is reached by traversing the main shipping channel and the Mystic River channel, maintained at depths of 40 and 35 feet respectively. A 40-foot depth is maintained along the existing wharf for berthing purposes. Since the river is too narrow to provide a good turning basin, larger ships often turn at the confluence of the Mystic and Chelsea Rivers and are maneuvered backwards under the Tobin Bridge to the wharf with tugs.

While the Mystic Wharf is located next to the Central Artery and I-93, making regional highway movements convenient, access to interchanges with these arteries is less than desirable. The interchange near Sullivan Square provides for direct movements via I-93 to the north, and less directly to the west via Route 128 and the Massachusetts Turnpike. Northbound movements can alternately use the Revere Beach Parkway to I-95. Traffic to and from the south and west can reach the Southeast Expressway and the Massachusetts Turnpike by using the Central Artery through downtown Boston, via the interchange at City Square.

Since Charlestown is a residential area surrounded by industry, local truck routes are generally located near the perimeter of these residential areas. Access to the Mystic Wharf area from Sullivan Square for northbound traffic is provided on Medford Street which is only 40 feet wide. Present average daily traffic volumes along Medford Street range between 3,000 and 5,000 vehicles, with truck traffic comprising a significant percentage.

The major truck route for southbound and westbound traffic is along Medford Street to Chelsea Street, and then through City Square to the Central Artery. However, the present geometric design of the entrance and exit ramps in City Square to the Central Artery is poor, and significant congestion is frequent.

Local rail access is provided to the Boston & Maine system through a rail yard in Somerville (about 1.5 miles away) and the West Cambridge yard (about another four miles distant). There is a connection to the Penn Central system via the inefficient Grand Junction Branch at the Somerville yard. If the Boston & Maine was more aggressive in developing container shipments direct to dockside and if cooperative agreements could be developed between the two railroads for easier switching, rail access to the Mystic River area from all destinations would be good.



MYSTIC TERMINAL – EXISTING USE

Existing Terminal Use

As previously mentioned, 25 acres of the wharf are owned by private concerns with presently viable operations. The 10 acre U.S. Gypsum plant is a gypsum board fabricating operation with significant investment in plant and equipment. They require, and presently use, ship, truck and rail access. The B&M property is presently used for storage of boxcars and Wiggins Terminal is a viable general cargo operation.

The Schiavone scrap operations, on 18 acres of land under long-term lease from Massport, also requires ship, rail and truck access and presently has exclusive use of the 900' berth at the west end of the wharf along the Mystic River.

Mystic Pier No. 1 is presently used for the stripping and stuffing of containers and for general cargo operations, particularly meat imports. The 10 acre site of Pier 1 has a ±240,000 s.f. transit shed as well as 2 smaller buildings used for a meat inspection station and a container repair facility.

Piers 48, 49 and 50 consist of approximately 7 acres and are presently leased to Catalano and Sons, Inc. for the movement of garbage by barge.

Mystic wharf is divided by a public access right of way consisting of the elevated structure for the Mystic River Bridge approach and a roadway underneath serving U.S. Gypsum and Piers 48, 49 and 50 from Medford Street. This access must be maintained as a public right of way. Terminal Street runs along the southern edge of the terminal dividing the terminal area from the BRA park along Little Mystic Channel.

The remaining 22 acres of the site comprise the Massport Moran Public Container Terminal. The terminal will have 1100' of marginal berthing when a 200' extension, now under construction, is completed in early 1975. This is sufficient for the largest container ships now in service or for 2 relatively smaller ships of 400' to 600'. The berth is served by 2 container cranes. A terminal building, intended for stuffing and stripping operations and office space, was recently constructed just to the rear of the east end of the berth. The building, as well as traffic around it, significantly inhibits the efficient flow of containers between the berth and storage areas, particularly at the 200' extension now under construction. The present terminal capacity is approximately 60,000 TEU's per year.

Efforts currently under negotiation to improve the capacity and accessibility of the Mystic Terminal as well as other alternatives are discussed in the following sections.

Expansion Potential

Expansion of the Mystic Container terminal is constrained by a number of factors including:

1. The U.S. Gypsum operation has significant investment in plant and equipment and it is important to the community tax base, making purchase of this site undesirable.

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E. G. Frankel, Inc.
Author

Containerport Study
Title

Date	Issued to

LPI 210 3306

Date	Borrower's Name

2. It is unlikely that an acceptable site can be found for relocation of the Schiavone scrap operation.

3. Acquisition of the B&M railroad storage area has been discussed by Massport and B&M, but to-date only 2 acres have been agreed to be purchased.

4. The physical layout of the wharf, divided by access roadways and rail spurs which must be maintained and the "satellite" orientation of the stripping and stuffing operation at Pier 1, is undesirable for efficient container handling and storage.

5. Access to and from the wharf, via City Square or Sullivan Square, is difficult at best, and improvements are beyond the authority of Massport.

Nevertheless, certain land use changes, consolidations, and relocations can and are being undertaken which will significantly improve the capacity of the terminal.

Current Expansion Plans

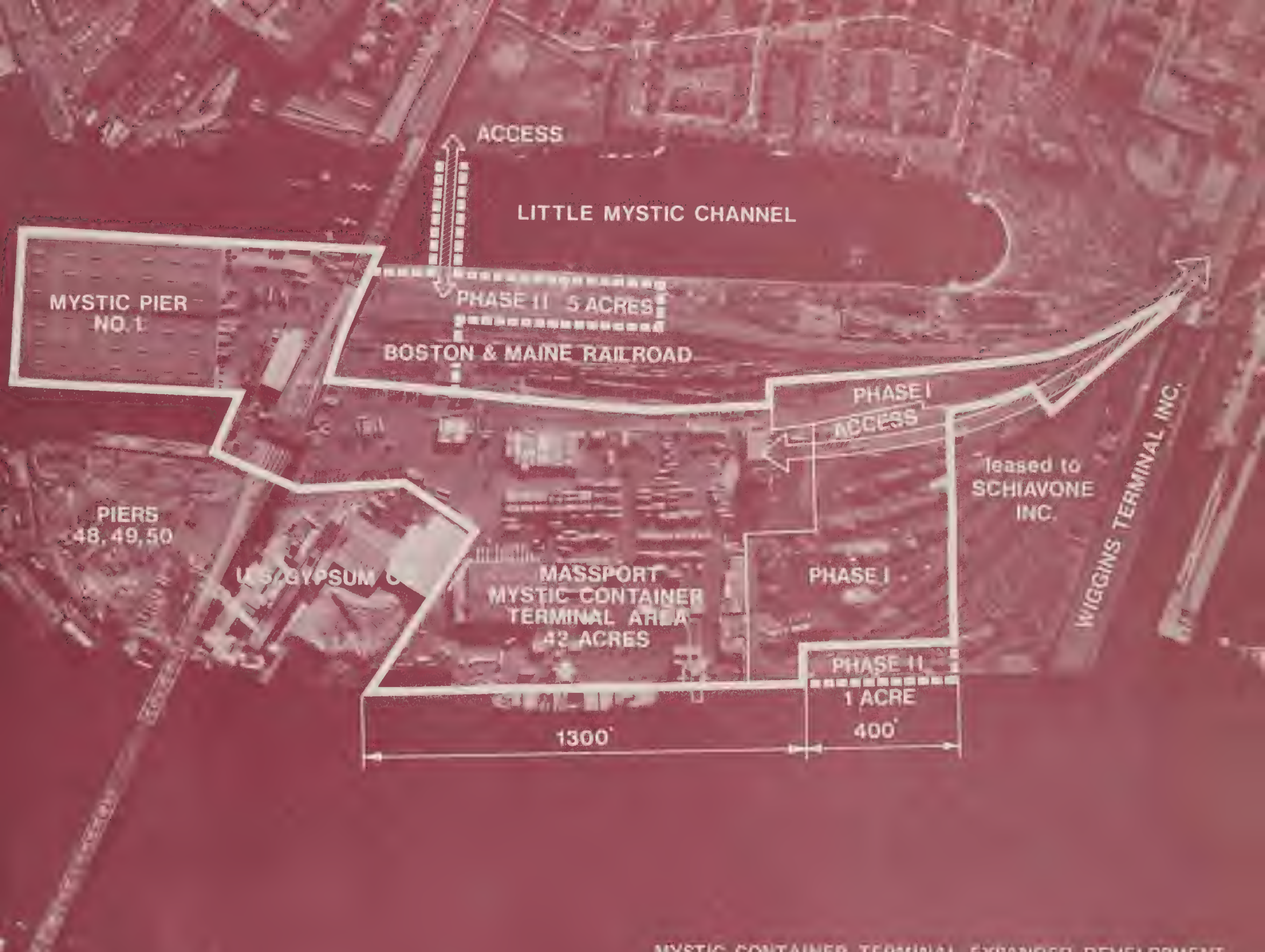
Massport is currently negotiating certain relocations which will improve operating efficiency at the terminal to some extent.

Approximately 8 acres of the Schiavone lease area will be available for container terminal use including 200' of berth next to the terminal in exchange for land on Piers 48, 49 and 50, to be used for Schiavone's metal shearing operations. This transfer is presently being implemented by Massport. Plans call for the reconstruction of the 200' wharf length to required load capacity and extension of the container crane rails at a cost to Massport of approximately $3.1 million based on 1977 costs.

The B&M Railroad is willing to relinquish 2 acres of land not used for storage, along the southern boundary of Schiavone property. Site work of the B&M and Schiavone property will cost approximately $0.8 million at 1977 price levels. The Department of Public Works and Massport are presently studying alternative locations for a new, low level bridge across Little Mystic Channel, on either side of the Mystic River Bridge, to provide an alternative access route from City Square. Traffic circulation improvements are also being considered for City Square itself. It appears that a bridge location upstream of the Mystic River Bridge approach is most desirable from the standpoint of providing good internal circulation at the Terminal.

A computer system is presently being installed at the terminal which will eventually provide data for optimal container scheduling, and handling as well as stacking order and location.

In addition, Massport is studying the feasibility of providing a rail-mounted, computer operated bridge crane between the new transit shed and the new Schiavone site boundary, parallel to the wharf. The length will be approximately 1,200' and the cranes will automatically locate and stack containers in the backland and feed the wharf-front container cranes. The cost for



MYSTIC CONTAINER TERMINAL EXPANDED DEVELOPMENT

a crane of this type and its necessary foundation is approximately $3.7 million.

The 8 acres from Schiavone, the 2 acres from B&M, and the 10 acres of Mystic Pier 1 will bring the total land area for container operations to 42 acres as shown. This, in combination with the construction of the computerized bridge cranes and extension of the wharf and crane rails, will increase the annual capacity of the Mystic terminal from the present 60,000 to approximately 95,000 TEU's. The total cost of these improvements, not including the channel bridge or purchase price of the 2 acres from B&M will be approximately $7.6 million at 1977 price levels - the expected midpoint of construction if this plan were implemented immediately.

Other Expansion Alternatives

In addition to the improvements just outlined, certain other possibilities have been identified during this study which could improve the efficiency and capacity of the Terminal operation. These are designated as Phase II development plans on the accompanying graphic and include:

1. Negotiation with Schiavone and Wiggins to allow Schiavone to use the north end of Wiggins wharf for ship docking and to allow the container terminal to jointly use ± 400' of Schiavone's wharf for the mooring of exceptionally large ships. This 400' wharf extension might cost approximately $10 million at 1977 price levels.

2. Negotiation with BRA and B&M for the purchase of 5 acres of the park and rail yard along Little Mystic Channel for use as a parking area for infrequently used vehicles and/or empty containers. BRA appears to be willing to negotiate such a sale.

3. The Mystic Pier 1 transit shed could possibly be modified, depending upon its internal structural configuration, so that the center 200', perpendicular to the shore, would be used as a storage facility. The north side could be used for stuffing and stripping containers and the south side as a truck loading dock. This would provide significantly improved external circulation for trucks and containers. Cost estimate would depend on detailed engineering study.

4. The container repair facility should be relocated to Piers 48, 49 and 50. The meat inspection station should similarly be relocated, and the two buildings demolished for improved circulation and storage space.

5. Negotiations with U.S. Gypsum should determine if a mooring bollard might be placed on their property to allow maximum usage of the existing terminal docking space along the new 200' extension.

6. At some future date, consideration should be given to removing or relocating the transit shed in the northeast corner along the wharf to allow greater handling efficiency and extension of the rail-mounted bridge cranes.

While these improvements are likely to increase the overall capacity of the terminal only about 5000 TEU's (from 95,000 to 100,000 TEU's per year), significant improvement in handling efficiency should be achieved as well as a reduction in handling costs.

4 ALTERNATE FACILITY LOCATIONS

INTRODUCTION

Previous studies have already explored in detail those four sites within the Boston Inner Harbor which have the greatest potential to satisfy the additional container facilities shown to be warranted by 1990. These sites are Castle Island, Naval Annex, Mystic Wharf and East Boston Terminal.

Each of these sites was evaluated in these preceding studies with respect to the factors considered in the selection process. These factors include ease of navigation to established shipping routes; access to local and regional land transportation networks; space for berthing, container storage and handling, stripping and stuffing operations; and compatibility with adjacent development.

The two existing container terminals, Mystic and Sea-Land, have been explored still further in the previous section of this report. This section will discuss sites beyond the Inner Harbor as well as the Naval Annex and East Boston.

BEYOND INNER HARBOR

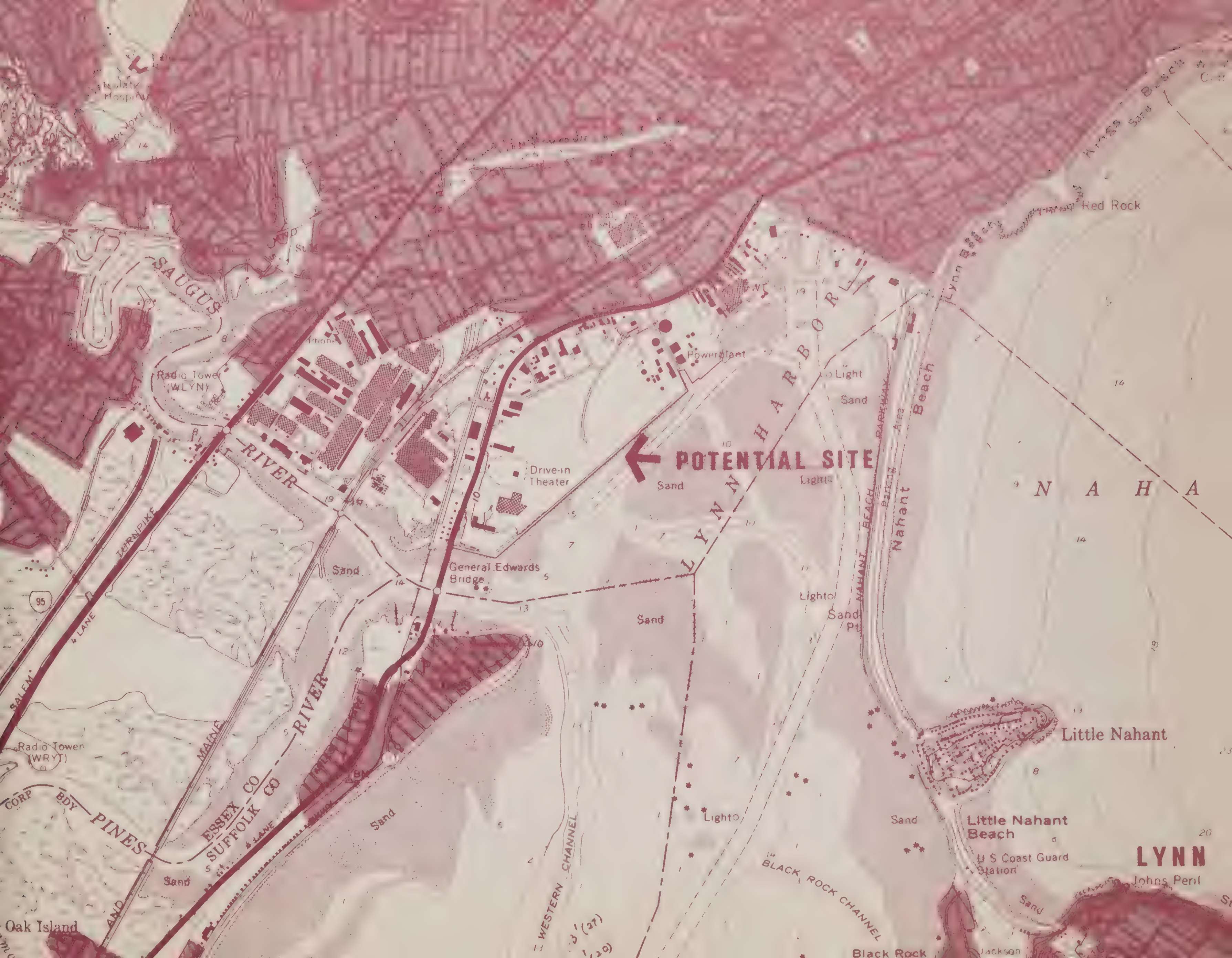
Three other potential sites have been reviewed in conjunction with this report to determine whether it might be possible to develop the needed additional facilities beyond the Boston Inner Harbor limits. These sites, within that region often ascribed to Metropolitan Boston, are Lynn, Squantum Point and Boston's Outer Harbor Islands. They were selected as the only potential sites satisfying the basic selection criteria between Newburyport and Cape Cod.

The characteristics of these three additional sites may by summarized as follows:

Lynn - This site is located adjacent to Route 1A along the west shore of Lynn Harbor, and between the General Edwards Bridge and the New England Electric power plant as shown in the accompanying plate. The major portion of this site is currently used as a sanitary land fill, and is expected to be filled to practical capacity in about 2 years. Because the materials placed in land fills decompose slowly over the years, pavements in storage and roadway areas will show long-term settlements, no doubt affecting the efficiency of container handling operations at this site.

Approximately 58 acres could potentially be developed without filling beyond the present shoreline, providing about 2,500 feet of marginal berthing. Substantial channel improvements would be required to reach open water, almost 3 miles distant. The minimum navigational access to the site would require a channel 400 feet wide and 40 feet deep, as well as a turning basin to allow for ship maneuvering while berthing. In total, these improvements would necessitate dredging at least ten million cubic yards of harbor bottom materials, resulting in a significant off-shore disposal problem.

Truck access to the site is only marginally adequate since Route 1A is already congested with vehicular traffic through heavily developed areas. All origins/destinations would require the use of Route 1A northerly to then reach Route 1 and Route 128 to the north and west, or Route 1A southerly through the Sumner/Callahan Tunnel or the Tobin Bridge to the Central



POTENTIAL SITE
LYNN HARBOR
NAHANT
LYNN
SAUGUS RIVER
PINES RIVER
Radio Tower (WLYN)
Radio Tower (WRYT)
Powerplant
Drive-in Theater
General Edwards Bridge
Red Rock
Lynn Beach
Nahant Beach
NAHANT BEACH PARKWAY
Little Nahant
Little Nahant Beach
U S Coast Guard Station
Johns Peril
Oak Island
Black Rock
BLACK ROCK CHANNEL
WESTERN CHANNEL
Sand Pt
ESSEX CO
SUFFOLK CO
CORP BDY
SALEM AND
TURNPIKE
4 LANE
95
Sand
Light

Artery and Massachusetts Turnpike to the south and west. Rail access is even more difficult, since a connection with the existing B & M freight line along the west side of Route 1A might conveniently serve only traffic to and from the north. Even then, a connection with this line would require crossing the heavily travelled Route 1A through already developed commercial property.

In summary, while the site has a potential for development, its land area is relatively small, restricting long range planning; access to both the regional land transportation networks and to open water is very poor; it requires very extensive dredging; and will be subject to long-term pavement settlements. For these reasons it is not recommended for further consideration.

Squantum Point - There presently exists an unused land mass of about 69 acres fronting on both Dorchester Bay and the Neponset River, at the tip of the abandoned Naval Air Station. Adjacent to this is another parcel of about 51 acres. (See accompanying plate) This area is bounded by a marina and by the Jordan Marsh warehouse complex, and these constraints would limit marginal berthing to about 2,350 feet and 2,100 feet respectively.

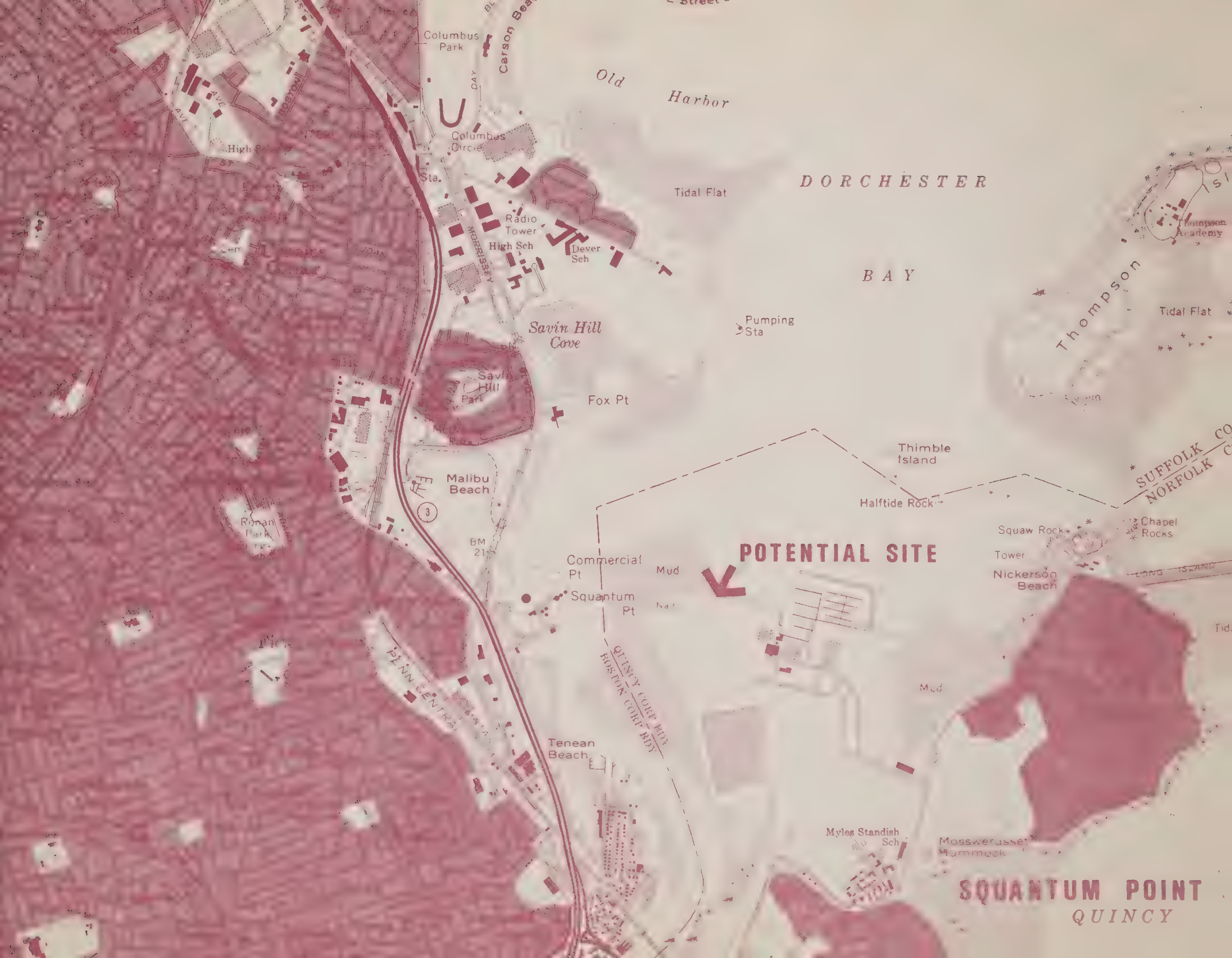
The main shipping channel and open water is about 3 miles from this site. Channel improvements would be required to provide for the minimum navigational access and a turning basin. About 9 million cubic yards of bay-bottom sediments and other materials would require dredging, and for the most part disposal at offshore dumping grounds. The existing surface grades require filling across some of the land mass, which would likely result in substantial long-term settlement of that area.

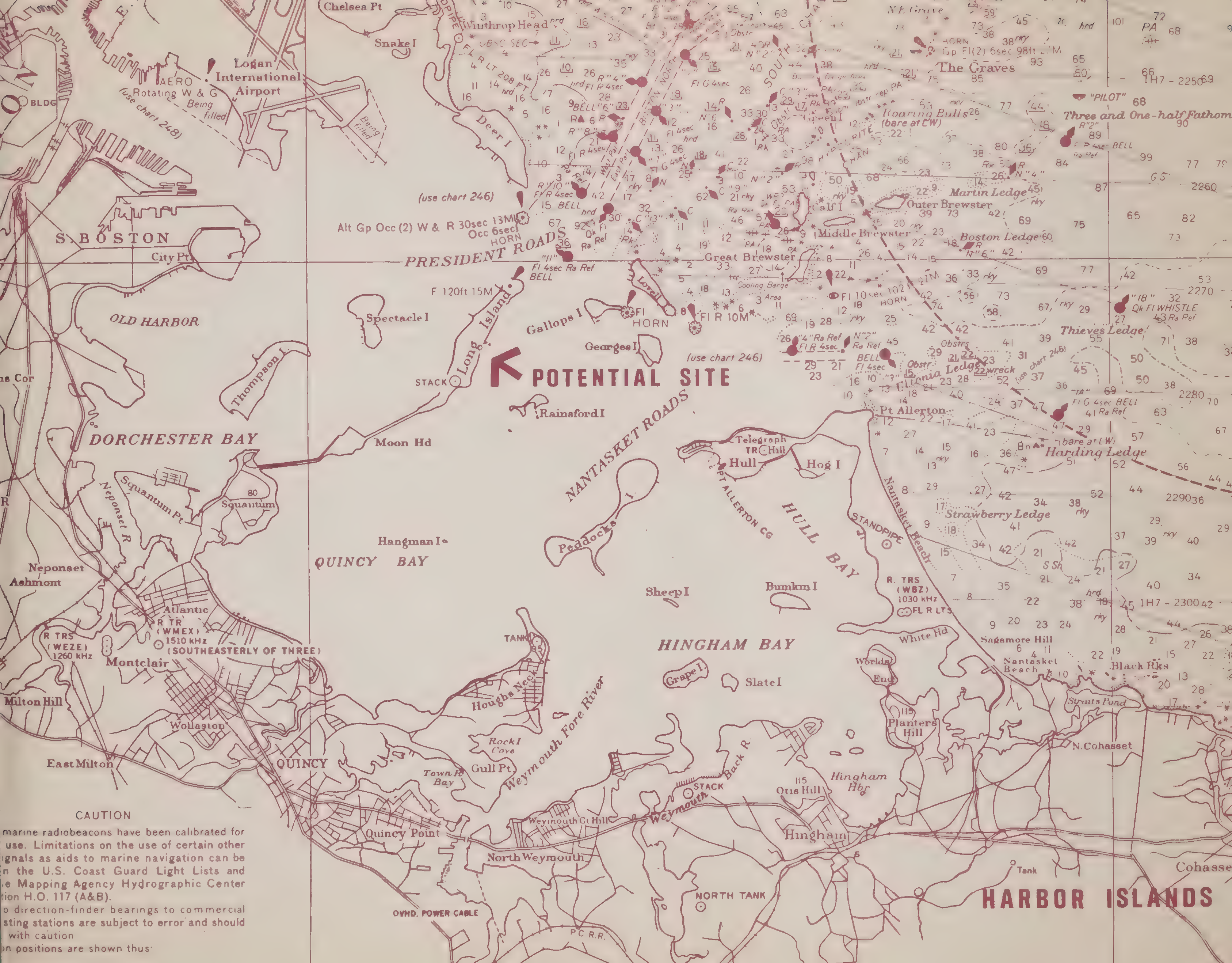
Access from this site to the highway network is relatively good, albeit to an over-crowded Southeast Expressway via Morrissey Boulevard and the Neponset River Bridge. Traffic movements from the site from and to the south and west via Routes 3 and 128 would be made more efficient than those to the north and west. There is no convenient access from this site to any portion of the rail network, since freight traffic would be prohibited from using the nearby trackage of the MBTA Red Line to the South Shore.

In conclusion, several factors combine to weigh heavily against developing this site for container facilities: the lack of rail service; the adverse impact and large cost for extensive dredging and disposal; and the potential long term settlements from terminal operations.

Harbor Islands - It is not unreasonable to consider the use of one or more of the harbor islands, providing there can be a direct and easy vehicular connection with the mainland. Barging of containers between any island facility and the mainland does not appear to be economical, since much duplication would be required at each end of the intermodal transfer route.

Of all the harbor islands, only Long Island is now directly connected by bridge to the mainland. A portion of the island contains a Civil War cemetery, and Long Island Head (at the north tip) contains the remnants of Fort Strong of World War I vintage. The location of


Columbus Park
Carson Beach
Old Harbor
DAY BL
BOSTON ST
High Sch
Columbus Circle
Sta.
DORCHESTER BAY
Tidal Flat
Radio Tower
MORRISSEY
High Sch
Dever Sch
Thompson Academy
Thompson Island
Tidal Flat
Savin Hill Cove
Pumping Sta
Savin Hill Park
Fox Pt
Thimble Island
Halftide Rock
Malibu Beach
3
SUFFOLK CO
NORFOLK CO
Ronan Park
Chapel Rocks
Squaw Rock
BM 21
POTENTIAL SITE
Tower
Commercial Pt
Mud
Squantum Pt
Nickerson Beach
LONG ISLAND
QUINCY CORP BDY
BOSTON CORP BDY
PENN CENTRAL
Mud
Tenean Beach
Myles Standish Sch
Mosswetusset Hummock
SQUANTUM POINT
QUINCY



CAUTION

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the Chronic Disease Hospital on Long Island necessitates traffic moving beyond the complex to pass directly through it. A new bypass waterway along the east coast could alleviate this problem. Excavation of the dense glacial materials comprising the island's topographic form, while somewhat difficult, would result in materials suitable for reuse.

Access to the regional highway network is severely restricted where traffic movements pass through the residential portions of Squantum to reach Morrissey Boulevard. Obviously, no direct rail connections are even remotely feasible to the islands.

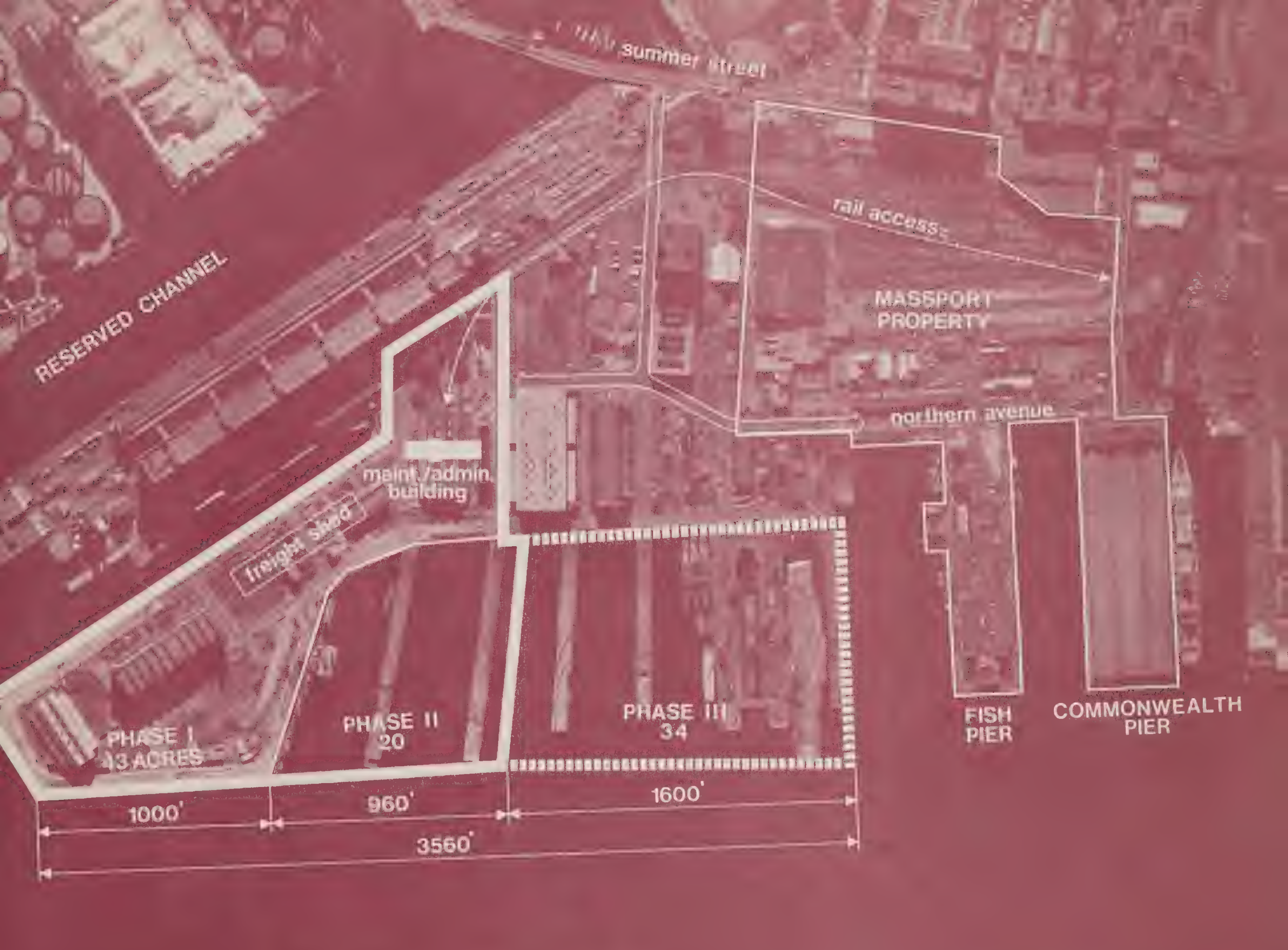
In short, the use of the outer harbor islands cannot be practically converted to use as a containerport and still provide the facility with the basic requirements of convenient rail and truck access. Implementation of past planning studies which emphasize the historical significance and substantial recreational potential of the island would be a better utilization than for a container terminal.

INNER HARBOR

Naval Annex - The entire complex presently owned by the United States Government north of Summer Street consists of about 227 acres (184 acres at the Naval Annex and 43 acres at the Army Base). This is the largest of all the sites being considered in this study in terms of both potential acreage and extent of wharf facilities. It faces both the main shipping channel and the Reserved Channel, and is opposite the Castle Island site discussed elsewhere. The land portion of the site comprises 138 acres, and the water area behind the pierhead and bulkhead line represents an additional 89 acres.

There are 5 abandoned finger piers on the site, all in very poor condition and unsafe for use. There are 2 active drydocks in this complex - one about 700 feet long to the west of the area, and the other about 1,200 feet long near the Army Base. At the east end of the Naval Annex is a man-made peninsula which includes 2 jetties, both of which are in good condition and can be used for marginal berthing. The existing wharf at the Army Base allows for 4,150 feet of berthing for general cargo shipping along the Reserved Channel, and is in good condition.

The Naval Annex portion of the complex has extensive warehouse and shop facilities of varying sizes, for the most part of steel-framed construction. Two multistory warehouses near the Summer Street entrance could be retained for conversion to terminal operations, resulting in a total area of 124,000 square feet. An existing maintenance facility and shop comprising about 37,000 square feet could also be retained to serve the terminal operations. The structures on the Army Base portion of the complex are of more substantial construction. Building Nos. 7 and 8 at the harbor end of the wharf are both 3 story steel and concrete structures, each having a total floor area of 554,000 square feet. Building No. 10 is a 2 story steel and concrete structure, totaling about 333,000 square feet. Building No. 4, used for storage and administrative functions, is an 8 story concrete structure with a total floor area of 1,683,000 square feet. These buildings,



NAVAL ANNEX CONTAINER TERMINAL DEVELOPMENT

with an aggregate of more than 3,100,000 square feet of floor space, would be very expensive to demolish.

The site is less than one mile from the entrance to the Inner Harbor, facing both the main shipping channel (40-foot depth) and the Reserved Channel (35-foot depth). There is ample area for ships to turn around when maneuvering for berthing. Navigational access is relatively straight and unimpeded, but ships destined to this site pass through the approach zones at the ends of Runways 4L, 4R and 9 at Logan Airport. Container cranes and berthed ships may intrude into the sloping critical zones of these runways along portions of the site.

In order to make maximum utilization of the portions of the Naval Annex site for container operations, the area behind the pierhead line should be filled. The existing timber finger piers must be completely removed prior to these operations. The smaller drydock could be filled for long range development if a use had not been found for it. About 97 acres of land and 3,560 feet of linear marginal berthing would be provided by totally filling to the pierhead line along the main channel as shown.

Approximately 1,100 feet of this length would be located beneath the critical zone of runway 9L, probably requiring a low profile crane. The marginal berthing along the Reserved Channel would still be utilized for handling general cargo. If the ultimate development of this site to its maximum potential capacity is deemed to be excessive, then only a portion of the complex could be dedicated to terminal development, and the remainder assigned for other compatible purposes by others.

The Naval Annex is located in an area of industrial, warehousing and commercial facilities which already generates truck traffic and which acts as a buffer zone between the major residential areas in South Boston and the harbor. Traffic movements along Northern Avenue to the Central Artery, and then to the Southeast Expressway and the Massachusetts Turnpike, provide direct access to the south and west. However, the existing bridge over the Fort Point Channel should be replaced since its three openings of 18.5 feet restrict traffic flow and its posted load limit is only 15 tons. The Central Artery also provides direct access to the north via I-93 and the Mystic River Bridge to I-95. Alternate access via Summer Street would encounter congestion at Dewey Square and be restricted by two limited capacity bridges: the one over the Fort Point Channel is posted at 16 tons and the other over the railroad yard at 12 tons. Both bridges would have to be upgraded if Summer Street is to be used as an access route. Indirect routing for both north and south movements can also be provided by using the existing local street system through South Boston to the Broadway Bridge. This route however traverses narrow streets with difficult turns and congestion at the MBTA bus station at the intersection of Broadway and Dorchester Avenue. It should not be considered a major access route for this site.

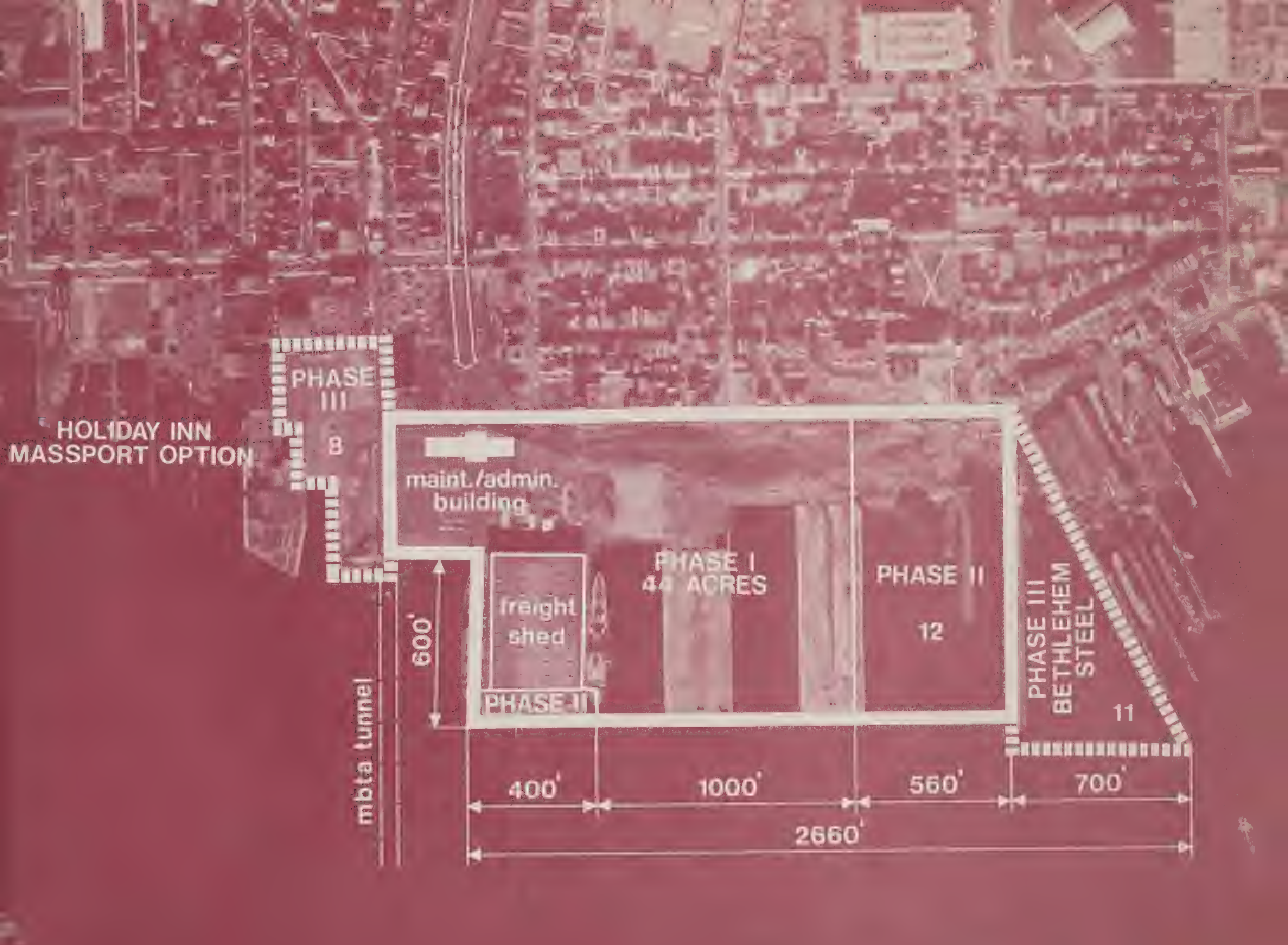
Local rail access is provided to the Penn Central system. However, the Dorchester-Shoreline branch which provides direct service to the south has no connection for direct movements to the west or north. Westbound traffic must first move southerly and then be rerouted to connect with the main freight line at Framingham. This circuitous route causes time delays, resulting in increased costs. Northbound rail traffic utilizes an even more circuitous and inefficient routing through Beacon Park in Allston, for switching to the B&M system via the Grand Junction Branch in Cambridge.

East Boston - The site considered extends outboard from Marginal Street and includes both the land and water areas now utilized by the large finger piers identified through a long marine history as East Boston Piers 1, 3 and 4. This area, totally the property of Massport, now contains about 35 acres of land and about 21 acres of pier decking and open water. Pier No. 1 is the newest pier in the Port of Boston and is in very good structural condition. Pier Nos. 3 and 4 are in relatively good condition. A portion of the land area behind the piers is paved and is currently used for miscellaneous storage.

The site is about two miles from the mouth of the Inner Harbor, adjacent to the main shipping channel which is maintained at a 40-foot depth below mean low water (MLW). As ships pass through the Inner Harbor, they intrude into the approach zones at the southerly ends of three runways at Logan Airport. Superstructures of ships passing through the harbor could theoretically interfere with aircraft, but in practice approaching aircraft are kept at higher altitudes when shipping is present. There are no other serious impediments to navigation at this site.

For maximum utilization of this site as a new container terminal, the entire area from existing shore to the pierhead line should be filled after Pier Nos. 3 and 4 have been demolished and removed. Landward expansion would be limited to Marginal Street, and there would not be any taking of any private property or intrusion into residential area. This would provide a total of 56 acres of terminal space. About 1,960 feet of marginal berthing will thus become available along the main channel. Pier No. 1 should be integrated into the new terminal without substantial change, since it is now and would continue to efficiently handle conventional cargo. About 600 feet would still be available along the west side of Pier No. 1 to berth a conventional cargo ship or a roll-on, roll-off vessel with cargo discharge directly into the yard without interference to wharf operations.

Westerly expansion of the site into the Holiday Inn (option) area could provide approximately 8 acres more storage space. However, the MBTA tunnel extending beneath Boston Harbor and Lewis Street to East Boston restricts heavy development. Expansion to the east into a portion of the Bethlehem Steel Shipyard would be possible without serious disruption to present shipyard operations. However, practical expansion would be limited to about 110 feet along Marginal Street, and would add approximately 11 acres and 700 feet of marginal berthing.



EAST BOSTON CONTAINER TERMINAL DEVELOPMENT

The East Boston site could be developed in phases. Phase I would provide a 1,000 foot, one berth, 44 acre facility. A maintenance-administration-scales building would be constructed sufficient to serve the completed Phase II terminal. The existing freight shed would be used with minor modifications. Phase II would add a second berth and 12 acres with a total marginal wharf length of 1,960 feet. This requires cutting back the existing freight shed and reconstructing the wharf in that area to allow access by the container cranes. Expansion beyond Phase II would be possible only if additional land can be purchased. A 3 berth, 75 acre facility might be ultimately provided.

Since East Boston is virtually surrounded by water, direct vehicular access to the south and west crosses the harbor at either the Sumner and Callahan Tunnels or the Mystic River Bridge. Both facilities are congested during rush hour and have moderately high traffic volumes during the remainder of the day. Traffic bound for the north and northwest would be along an established truck route in Chelsea to the Northeast Expressway (I-95N) or to Route C-1. Access to these major truck routes through existing local streets should not be generally permitted except for short portions of already established commercial routes.

To best utilize this site for new container facilities, the abandoned Penn Central right-of-way south from the Chelsea River through residential and industrial areas to the waterfront should be purchased so that a direct access route could be developed solely for the truck and railroad traffic generated by a new terminal. In this way traffic could be eliminated from the highly developed residential and commercial areas around Maverick and Central Squares, and will greatly minimize any adverse community impact. No demolition of structures or displacement of storage tanks will be involved. Truck traffic would connect with the designated truck route on Marginal Street in Chelsea, which in turn provides access to the regional highway network. The right-of-way is depressed below grade from the site to the Route C-1 viaduct structure, and truck noise will be substantially muffled especially with plantings and slope treatment. A further positive contribution could be the construction of a deck over the right-of-way between Sumner and Maverick Streets, to make space available for community uses such as playgrounds and parks. Three bridges carrying local traffic over the right-of-way are located between the site and Route C-1, and all provide approximately 16 feet vertical clearance. The maximum width of right-of-way along this route is about 34 feet, the existing clear-distance between the abutments of the existing overpasses. This width would accommodate two 12-foot truck lanes complete with shoulders. This access roadway would be separated beneath the expressway viaduct as required to pass between the existing viaduct structures. Beyond Route C-1, the total width of open space adjacent to the right-of-way varies from about 90 feet to as much as 150 feet. A single track would be installed in one lane to provide for future rail traffic.

Direct connections for traffic onto the existing ramps along C-1 will be difficult to provide due to grade constraints. A connection near Porter Street would

be undesirable since heavy traffic would thus be placed on existing multi-use streets, negating the benefit of the right-of-way. A connection to the Expressway between Porter and Bennington Streets is not practical because the expressway is elevated in this area. The most practical connection would be at Chelsea Street, about 1.7 miles from the site.

Rail service from the site could also be provided within the dedicated truck route along the abandoned right of way. All rail traffic must be first transferred to the B&M rail network, but this transfer is direct and not excessively time consuming. Switching of rail traffic destinged for the Penn Central Main line to the south and west at the inefficient Grand Junction Branch of the B&M system through Cambridge is a great disadvantage in both time and expense.

5 KEY ISSUES

INTRODUCTION

Decisions relating to port expansion and relocation of facilities must consider the issues and implications of development upon the local community and its physical and social environment, as well as operational, economic and market factors. In this section, we review the key issues and broad effects of all container port expansion and of all the sites, those currently engaged in container operations and those offering development potential.

The following discussion is broad in scope and intended to identify the issues involved and their dimensions. Detailed analysis would obviously be required for any of the development alternatives which are selected for further investigation. The issues are addressed under the major headings of:

- Physical requirements and constraints
- Economic considerations (both internal and external)
- Policy issues
- Physical and natural environmental concerns
- Socio-economic environmental concerns

PHYSICAL REQUIREMENTS AND CONSTRAINTS

The physical considerations and concerns relating to development of facilities have been dealt with in previous chapters of this report. These can be summarized as:

- Land area - the total acreage available, its configuration and waterfront exposure as related to the potential efficiency and security of operations.
- Land utilization - current land use and existing structures; demolition/construction requirements; physical constraints on internal movement or facility location; joint or alternate use potentials; use of adjacent parcels, etc.
- Geophysical conditions - soil, subsurface and harbor bottom conditions as related to type and cost of construction, fill, dredging, loading, etc.
- Waterborne access - navigational approaches and hazards, channel depths and any other factors which might restrict ship movements or operations.
- Land transportation access - availability, capacity and condition of existing and potential highway and rail access to regional transportation networks.

ECONOMIC CONSIDERATIONS

Fiscal Factors and Development

The major concerns which Massport must evaluate in considering alternate development schemes include: total capital investment requirements (for land, equipment, land and sea access, berthing space, and for

structures, etc.); the variable costs associated with container handling, especially in a matter due to differences in the inherent advantages of alternate locations; the potential revenues and cash flow as related to total debt services (both amortization and interest payments); and the period of time between construction and break-even operation. In today's uncertain and weak bond market, capital fund acquisition is a major concern and thus schemes reducing or deferring large outlays of capital would be of primary interest to Massport.

The projections in Section 2 indicate facility capacity requirements for 241,000 TEU's by 1990. This represents an expansion requirement of some 146,000 TEU's over the existing capability. This additional capacity could be developed in a number of ways. Development of a full scale facility at either South Boston or East Boston would create additional facilities capable of handling some 175,000 TEU's at a cost approximating 45 million dollars. At East Boston this cost would include purchase and development of the Penn Central right of way for exclusive access by terminal traffic. The cost at South Boston does not include necessary access improvements beyond the site boundaries. This would provide sufficient capacity to take the port through 1995 at a cost of about $257 per TEU of annual capacity.

Development of a 2 plus berth facility along the Reserved Channel on Castle Island would provide a similar capacity but at lower cost. Since no new land would have to be created at Castle Island, the cost of achieving an annual capacity of 175,000 TEU's would be approximately 33 million dollars (not including any costs for necessary off-site access improvements nor for relocation or loss due to relocation of existing tenants). This allows a figure of $189 per TEU of annual capacity. The relatively short-term 10 acre expansion of the existing Mystic Terminal would require some 8 million dollars of additional capital funding and yield additional capacity of about 35,000 TEU's per year; $229 per TEU of annual capacity. This additional capacity, however, would only be sufficient to meet the 1977 projections and would have to be augmented by additional expansion initiated prior to that date. Alternative 1c, described in Section 3, which involves development of a one-berth facility along the eastern face of Castle Island plus joint use of Sea-Land Terminal, would be the least costly alternative at some 11 million dollars ($129 per TEU annual capacity) but this would only provide for an additional 85,000 TEU's per year in 1986-87. Since potential joint use with Sea-Land is considered highly doubtful, this solution cannot be considered very strongly. Development of Berth 16 alone (alternative 1b) in conjunction with expansion of Mystic at a total cost for both facilities of some 18 million dollars would create a total capacity through 1981 at a cost of $190 per TEU of annual capacity.

Other alternatives considered to fill the capacity gap between the total capability with the existing Sea-Land terminal and an expansion of Mystic (130,000 TEU's) and the 241,000 projected 1990 demand would be a one-berth facility along the Reserved Channel (alternates 2a or 2b). This would entail a cost of approximately $15.5 million ($182 per TEU of annual capacity) but would still fall some 25,000 TEU's short of the projected 1990 demand.

Examining the various combinations cited above in terms of capacity and cost, it becomes clear that the most cost-effective choice would be the immediate development of a 2-berth facility along the Reserved Channel on Castle Island (Alternate 2c). This would yield sufficient added capacity by itself to carry the port to about 1995 at a cost of $189 per TEU of annual capacity. Such development would have further advantages in that it would consolidate public container operations at only two locations in the harbor and limit fragmentation of such facilities while providing economies of scale in operation. Unfortunately a number of questions regarding the potential of Castle Island must still be resolved; satisfactory relocation of existing tenants, formal approval of intrusion into Logan air space, and construction of adequate highway access. These factors plus Massport's expressed desire to minimize its capital expenditures (at least in a short-term, due to unsettled market conditions) point to a development strategy which expands the Mystic Terminal to an annual capacity of 95,000 TEU's as an immediate measure with simultaneous planning for the ultimate goal of expansion onto the Reserved Channel if this is possible, or into South Boston or East Boston as less preferred and more expensive operations.

The combination of Mystic expansion plus a 2-berth facility on the Reserved Channel would provide capacity beyond the year 2000 at a cost of some $41 million ($195 per TEU of annual capacity). Because of design and construction time requirements planning by the various agencies involved in considering Castle Island, South Boston Naval Annex and East Boston should be started at once. Initial development at Castle Island if selected could be started with one berth along the Reserved Channel (alternate 2a) in an attempt to minimize immediate capital outlay with possible savings in anticipation of better bond market conditions and should be evaluated against additional cost escalations associated with construction delays.

Since all the alternate development locations represent reasonably acceptable backland configurations, it has been assumed that operating costs per container will not vary drastically as a function of location. The Moran Terminal will probably operate at a lower efficiency than a new terminal at any of the other locations because of space and configuration constraints, and the net revenues per TEU accruing to Massport should be at least as high as Castle Island, South Boston, or East Boston as the figures projected for Moran.

It is assumed that the net revenues per ton will approximate $15-$20 per TEU by 1978 (depending on the 1975 dockworker strike settlement and subsequent labor contract negotiations). Given current bond rates and the 3 year gap between assurance of bonds and initial flow of revenues, the annual service debt for 25 year bonds will constitute approximately 10% of the total capital expenditures for any development project.

On this basis, expansion at Mystic would fall short of break-even when the expanded facilities begin to operate at full capacity (i.e. 1978). The Castle Island facilities would just about break-even at a point when they operate at full capacity, while facilities at South Boston or East Boston would never generate sufficient cash flow to meet annual debt service requirements.

The facilities at these latter 2 locations would not begin to show a profit until the bonds were retired.

It should further be noted that the existing operations on Castle Island, other than the Sea-Land Terminal, generate some $1.4 million in annual revenues to Massport. This represents direct income which helps to offset current operating deficits elsewhere in the Port and provides cash flow to meet a significant portion of the debt service deficit currently existing at Moran. Continued revenues of this type and magnitude would be mandatory to create the proper climate for additional capitalization, and any possible relocation which seriously decreases these net revenues should make development of container facilities increasingly more difficult from a fiscal standpoint.

Regional and Community Economic Considerations

Since none of the alternate locations under consideration presently generate tax revenues for the City, there would be no direct impact on City revenues. Only one of the sites (South Boston) is under active consideration as a potential source of revenues, and any developments at this site would have to be based on joint use opportunities with private industries and carefully designed to ensure compatability with potential private users. Development would augment it rather than decrease the utility and development potential of adjacent sites.

Expansion of any of the locations is likely to have at least some minor impact on City expenditures primarily for such items as fire protection, local street maintenance, and other elements of the municipal infrastructure. Expansion of container facilities would yield beneficial effects for the City in terms of both employment and comparative advantages to regional, commercial and industrial enterprises. Unfortunately, neither of these can be directly quantified within the scope of the present study. Container operations are not labor intensive, and the expansion of facilities would probably not create more than a few hundred dock jobs. However, secondary employment related to dynamic port operations typically multiply this employment base several times over. Availability of adequate facilities for receipt of raw materials and shipment of industrial output is a major factor for inducing industry to locate or remain in the region; and the lower transportation costs for goods coming into the region (due to elimination of need for reshipment) normally generates cost savings for regional suppliers which are passed on to customers and/or result in increased economic activity which also expands the employment base.

POLICY ISSUES

Both the Port Authority and City agencies must respond to a number of policy and long-range planning issues in evaluating the alternatives with respect to development of additional container capacity. The key elements are:

Consolidation and Master Planning

A long-range master plan should be developed by Massport, in cooperation with other interested parties, which responds to the key issue of the desired and

practical level to which container operations can be consolidated within the Port of Boston. Discussions in previous chapters have indicated that the Mystic site, even with further development, does not have the potential for supplying all the needed capacity. A major concern in examining other possible locations is the effect of fragmentation on port operations and marketability. From an operational standpoint, there are certain advantages to multiple facilities in that they reduce the possibility of incoming ships having to wait for berthing space. This is offset, however, by 1) loss of possible economies of scale if the fragmentation is too excessive, and 2) potential problems in feeder operations, where transfer of containers among internal harbor facilities might be required during marshalling of long-distance loads. The focusing of container activity at two to three primary locations within the harbor would appear to be a practical maximum.

Risk Factors

There are two basic types of risks inherent in the present planning situation. The first constitutes risks with respect to the matching of port capacities with market demand. Development in excess of demand would waste capital resources and generate insufficient revenues for debt services. Failure to build sufficient capacity will create a different set of problems for the port operator and its users. Overcrowding will create inefficiencies which will raise costs (without corresponding revenues) or a loss in competitive status. A lack of sufficient capacity will also be detrimental to the port's marketing activity in that it will make it more difficult to attract new shippers to the area or obtain long-term commitments from existing shippers. The market demand projections set forth in Chapter 1 are intended to be conservative in nature and are based on sufficient port capacity to handle the increasing tonnage volumes. They therefore reflect a base line capacity requirement which the port would need if it is to retain its own demonstrated growth.

The second type of risk addressed in this report is that of focusing on a single location for future development to the exclusion of all other potential candidates. A tendency in this direction would have serious adverse consequences if at some later date the site were not available. This is especially true in the case of the South Boston location where future ownership and development, joint use possibilities, acquisition terms and available acreages are all still in doubt. The time frame associated with development of each of the potential alternatives must be considered and the phased development and design plan outlined in the Consultant's recommendations (Chapter 6) would provide the greatest flexibility and reduction of risk at minimal cost.

Fiscal Policy

Portions of the land area and facilities at both Mystic and Castle Island are presently owned by Massport and leased to private operators. Development at these locations raises two issues related to revenues, cash flow and capital expenditures. The first of these concerns the desirability and possibility of renegotiating these leases; either to return part of the land area and facilities to Massport's direct (or joint) control or to relocate

some of the tenants on Castle Island to other sites within the harbor. Detailed analysis and resolution of these steps are beyond the scope of this report, but the basic issue is one of whether a policy of renegotiating leases or relocating tenants could result in: 1) the termination of existing operations which are highly profitable to Massport; 2) the reduction of Massport profit margins as a relocation inducement to tenants and/or 3) difficulties for Massport in negotiating advantageous leases with future tenants.

A second related issue pertains to the fiscal trade-off between existing revenues and long-term capital investments. Massport will have to evolve a consistent policy which focuses on the question of the relative weight of these two factors. The gross development cost estimates given in earlier chapters must be balanced against current revenues, especially in the case of Castle Island, which would have the lowest potential development cost. This issue is further clouded by current uncertainties as to the future volume of imported automobiles, which constitute a major present tenant.

Cost Sharing of Facilities

Each of the potential development locations would involve off-site capital improvements relating to highway access. Bridge improvements and construction required at the Fort Point Channel (for the Castle Island and South Boston sites) and on the highway ramps in Charlestown (for the Mystic site) would serve multiple users and which therefore would be primarily Commonwealth responsibility, possibly with some contribution from the City and/or Massport. The bridge over the Little Mystic Channel and the exclusive truck/rail right-of-way in East Boston would primarily serve the port facilities, but since they are necessitated by desires to reduce local street traffic and noise levels in adjacent residential neighborhoods, cost sharing would also be indicated for these improvements.

Establishment of Priorities

City, regional and Commonwealth agencies, together with Massport should address themselves to the establishment of a defined and comprehensive set of priorities with regard to waterfront land use, local versus regional costs and benefits, and tradeoffs. Such combined planning is necessary not only to place container developments in proper perspective, but to assure that the concerns of local citizens, implementation needs and the strength of the regional industrial base will each be given proper weight in planning and decision making.

PHYSICAL AND NATURAL ENVIRONMENT CONCERNS

The key issues in this regard, all of which will require detailed analyses for the selected actions, include:

Effects on Water Quality, Flow and Sedimentation

All the development alternatives would require some amount of filling, dredging and waterfront construction. Most of this activity would take place at South Boston or East Boston, where it would consist of filling between existing finger piers, and this should have

little adverse effect on water flow or quality. Nevertheless, detailed studies of the environmental effects of filling, dredging, construction and demolition will be required. Possible impacts and safeguards with respect to disposal of dredged material, sources and placement of fill, discharge of sedimentation and runoff, accidental ship discharges, cargo processing such as automobile washing/preparation, etc. must be identified and dealt with.

Air Quality

Similarly, analysis of the effects of expanded container operations on local air quality must be undertaken. In addition to construction impacts due to dust, demolition and construction equipment, the emissions from on-site equipment and truck movements and truck traffic on local streets must all be considered.

Noise

Evaluation of possible increases in existing noise levels due to new operations and potential countermeasures will also have to be considered. Here the key factors are the noise generated on-site by construction and operational activities and truck traffic on local streets. Some of the potential locations have noise sensitive land uses in the general vicinity of the possible expansion area (e.g., the public school, recreation area and public housing across Little Mystic Channel from the Moran Terminal).

SOCIO-ECONOMIC ENVIRONMENTAL CONCERNS

Local Area Traffic and Truck Activity

Containerport operations within the entire port area may generate an average of as much as 300-400 two-way truck movements per working day by 1990. Truck access to regional highway networks from a container location is, therefore, a prime planning criterion. The impact of traffic on local street networks during both construction and operation are similarly of major concern to the local communities involved. The community concerns in this regard focus on: 1) congestion due to increased truck traffic; 2) noise generated by these vehicles; 3) possible air quality impacts; 4) possible safety hazards. These constitute the direct effects of possible truck traffic. In addition, it would be necessary to study possible secondary effects of increased traffic specifically with respect to diversion of existing traffic on the other local streets, disruption of shopping patterns, general disruption of neighborhood cohesion and possible changes in land use and/or land value.

Present truck traffic from the Mystic Terminal moves eastward and westward along Medford Street and then via City Square and Sullivan Square to connect with the expressway system. This brings the traffic through residential areas of Charlestown. Expansion of the existing terminal facilities would increase the impact of such traffic unless an alternate route were provided. One possibility which is in the planning stages at the Commonwealth Department of Public Works is a bridge across the Little Mystic Channel, which with

improvements to the access and ramp systems to the Southeast Expressway and Central Artery, would divert substantial portions of the truck traffic along industrial lands adjacent to the Naval Shipyard and alleviate pressures in the residential neighborhoods. If major expansion at Mystic is contemplated, the channel crossing would be a valuable adjunct.

The East Boston site would present even more severe local traffic problems if containerport truck traffic is channeled on local streets. However, the existing Penn Central right of way leading from the terminal area to Chelsea Street provides a unique opportunity for complete removal of port related truck traffic from city streets via a dedicated roadway for both trucks and rail traffic along this right of way. This solution would have multiple benefits for the community if developments were undertaken in East Boston. The truck traffic will not only be removed from the streets but the depressed elevation of the right of way would yield excellent noise buffering capability. The right of way is presently unused and strewn with litter and debris. Its use as a dedicated access route to the port would result in a general clean-up of the area, and the route could be decked for part of its length to provide a needed greenbelt and parking area for local residents. The cost of such improvements are included in the gross cost estimates set forth in Chapter 4.

Both the Castle Island and South Boston sites have potential routes to major highways which do not traverse residential neighborhoods. Unfortunately, these routes are presently constrained because of the poor condition and weight limitations on the Summer Street and Northern Avenue Bridges across Fort Point Channel. The rehabilitation of these structures or construction of a new bridge across the channel would be required to keep the truck traffic out of South Boston residential neighborhoods. A new bridge across the channel at Northern Avenue is now under design. Even with the new bridge, some portion of the truck traffic might choose to connect with the Southeast Expressway via Broadway, a route which traverses local residential neighborhoods. Possible control mechanisms to prevent such flow should be evaluated. A further factor which should be considered is the possible construction of a seaport access road which would consist of a new roadway between the Naval Annex and the Fort Point Channel to prevent build-up of truck traffic along Northern Avenue. This possibility is in the early discussion stages between Massport and the City of Boston.

Alternate Land Uses

The development of new container facilities at any of the 4 potential sites would raise issues relating to alternate uses of the waterfront and backland areas either for industrial development which would generate tax revenues or more intensive improvement for waterfront open space and recreational facilities or for other types of land uses. Use of a site for containerport operations would remove the opportunities for other community related developments.

The area for expansion of the Mystic Terminal is on a peninsula with other heavy industrial uses, and is separated from the nearest residential areas by the Little Mystic Channel. Expansion of container operations

at this location would be compatible with the immediate adjacent land use and would not absorb land of potential value for other purposes, except for the strip of land on the immediate northern boundary of the Little Mystic Channel which does have some potential for marine recreational development. While the land could be used for industrial purposes, it should be noted that the Charlestown Naval Shipyard is adjacent to the Mystic peninsula and provides a large reservoir of prime waterfront industrial land available for such development.

The East Boston site is currently used for general cargo operations and is desired by the local community as waterfront open space and recreational area. The adjacent land uses inland from the Massport property include residential public housing and other uses which are not directly compatible with port operations.

The East Boston community is particularly short of open space and recreational facilities because of the large land holdings and expansion activities at Logan Airport which have taken much of the original East Boston land. The East Boston community has continually been the most vocal in opposing expanded use of Massport waterfront land. The community has already been selectively converting its waterfront properties along its northern and western portion for residential use and waterfront open space, and would very much like to divert the East Boston Terminal piers and backland for the same uses.

The South Boston Naval Annex is located in the midst of an industrial area, and development at this location would be compatible with existing land use. The area is relatively isolated from the South Boston residential community except for possible traffic incursions (as noted above). Development should not have any impact on the local residents. The nature and location of the area will not make it conducive to open space and recreational use. A key issue with regard to South Boston is the alternate use of possible containerport facilities for industrial development, which would create both jobs and tax revenues for the city. Both of these benefits are of prime concern to the City, and it has been actively searching for potential tenants and developers to replace the economic activity generated by the recently abandoned Navy operations. The most likely candidates for industrial development in the area are small and medium scaled shipbuilding and ship repair operations which typically require on the order of 50 acres or less. Examination of the available acreage and development configuration (see Chapter 4) indicates that the South Boston Annex has more than enough land and waterfront area to permit both industrial development and containerport operations. Multiple use of this location is thus not only possible but highly desirable.

Castle Island is in somewhat the same position as the South Boston Annex with regard to compatibility with existing land uses and isolation from the local South Boston residential community. The development of container facilities at this site would require a displacement of existing general cargo operations (primarily automobiles). This factor was discussed earlier and every attempt would have to be exercised to prevent loss of or to find suitable alternate locations for

these operations within the harbor to prevent loss of employment and comparative market advantages which could result if these operations moved completely out of the Boston area. The Castle Island site does not appear to be a prime candidate for intensive industrial development especially in view of the close proximity and availability of existing facilities to be found at the South Boston Annex.

Secondary Development

Another area of concern to the City and local communities would be any potential secondary effects in terms of population shifts, land use changes, land value changes, economic activity or the character of neighborhood shops and facilities. Given the existing nature of potential expansion sites, current adjacent land uses and the nature of container operations, it is difficult to foresee major changes in the above factors at any of the alternatives under consideration. The possible exception might be East Boston where cleanup and construction of a Greenbelt along the Penn Central right of way might upgrade land values and the character of the neighborhood in the immediate vicinity of the right of way. With this dedicated access route, conversion of existing general cargo piers to a containerport should not have great impacts on the adjacent East Boston community. Any action to release the terminal area from Massport control for community open space and recreation area should result in an upgrading of development opportunities and land values in the adjacent residential area. Precise estimates of the extent and magnitude of secondary impacts would require a substantial amount of detailed analysis which is beyond the scope of this report.

6 RECOMMENDATIONS

RECOMMENDATIONS

Analysis of the market demands for future containerized traffic through the Port of Boston has shown that if the shore facilities and shipper costs remain competitive, and if an adequate labor force is available, a constantly increasing flow of traffic will be realized. These projections of annual rate of increase are somewhat variable, but are expected to be conservative through at least the 1990 time frame. The actual traffic of both tonnage and number of TEU's throughout this period will most likely surpass these projections.

The potential for additional capacity at the Moran Public Container Terminal at Mystic Wharf is limited by several constraining factors, including present land use, limited berthing, lease conditions, and property ownership. The effects of some of these are less critical than others, but it is our conclusion that without massive property acquisition from others and extensive modification of lease agreements, expansion of the Moran Terminal could not provide for the projected 1990 containerized traffic demand. Thus, we foresee the need for a new public container terminal as the most optimum method to increase the Port's total capacity to satisfy this demand, without severely infringing on the anticipated on-going demands of non-containerizable general cargo traffic.

There are several recommendations which we propose as being in the best interests of all parties involved in the benefits, both direct and indirect, which will accrue; that is, they represent an action which will have an immediate end use to satisfy a part of the demand. Other recommendations are components of a series of alternate courses of action, and each course could in itself satisfy a portion of the remainder of the demand. Briefly, these recommendations are as follows:

1. Immediately develop the Mystic Wharf area to its fullest potential, by assembling the following land parcels:

   a. 8 acres from Schiavone lease, including 200 feet of waterfront berthing.

   b. 2 acres from B & M.

   c. Additional land from B & M (up to 9 acres).

   d. Additional land from Schiavone (about 1 acre) to allow for about 400 feet of joint-use waterfront berthing.

   e. Additional land from BRA along Little Mystic Channel (about 5 acres).

   By optimizing the storage and handling operations within the expanded area and taking advantage of the resulting economies of size and scale, the total annual capacity will be increased to about 100,000 TEU's, but this would only satisfy the anticipated demand for public terminal use until about 1977.

2. Immediately prepare a layout and facility plan for a new public container terminal at the South Boston Naval Annex to allow joint use by others on remaining Annex land, and showing the extent of

land (including rail and truck access) which should not be included in the general disposition process by the Department of Defense and GSA.

3. Immediately prepare another layout and facility plan for a new public container terminal adjacent to the Sea-Land terminal at Castle Island. This would require further study of at least 3 separate phases:

   a. The formal application to the FAA and other appropriate agencies for the installation of container cranes, and thus the physical intrusion into the airport approach zones, along the wharf, by both cranes and ship masts.

   b. The effects upon both tenants and Massport if certain revenue-producing general cargo tenants were to be relocated from Castle Island to another satisfactory site within the Port.

   c. The possibility of joint use of the existing container crane and the 600 foot berth now operated solely by Sea-Land.

Each of these phases will required additional study due to the potential effects of unique conditions which by their nature cannot now be reasonably ascertained. The resolution of each phase would, like the recommendations above, result in an option for terminal development which could then be exercised.

4. Upon the conclusion of recommendations (2) and (3) above, and comparison with development potential at East Boston, prepare a final, long-term recommendation to establish a new public container terminal at either the Naval Annex, Castle Island enlarged by relocation of present tenants, or at the East Boston Terminal.

With potential expansion for container traffic and general cargo at Castle Island, the Naval Annex, the Mystic Wharf or East Boston, it must be emphasized that existing local streets connecting each of these sites can only marginally handle the traffic connecting with the regional highway network. Traffic from Castle Island and the Naval Annex would traverse East First Street to Broadway through South Boston, or along Summer Street or Northern Avenue. The former route, through streets already congested with heavy truck traffic, is very inefficient. Both bridge crossings of the Fort Point Channel are restricted to narrow lanes and loading conditions, and would require reconstruction. Similarly, some of the additional traffic generated from expanded facilities at the Mystic Wharf area could better be handled by the addition of a new bridge crossing over the Little Mystic Channel. With subsequent improvements in City Square and the ramp complex onto the elevated roadway structure, this would relieve heavy traffic in other parts of Charlestown. The East Boston Terminal has a potential traffic advantage, since an abandoned Penn Central right-of-way could be developed to divert terminal traffic from the already congested city street system to this exclusive use separated route.

As these initial recommendations are being implemented, steps should also be immediately taken to commence with the preparation of any required environmental impact statement(s) to demolish the existing abandoned finger piers at the South Boston Naval Annex. Regardless of ultimate disposition of the Federal property, these piers require demolition if only to alleviate the potential for additional navigational hazards to established shipping and boating. Further, if additional construction (whether dredging or wharf construction) might be required at either the Naval Annex, Castle Island or East Boston to up-grade the existing facilities to greater or different use, preparation of these statements should also be started. Some preliminary design work would be required to adequately prepare these statements, but the potential savings in future design and construction time would far outweigh any small disadvantages of design costs for false starts or subsequent changes in site usage from that initially programmed.

It must be recognized that except for expansion at Mystic Wharf, which should be implemented immediately, the recommendation for a new public container terminal must involve further discussions, negotiations and evaluation by the various agencies involved before its location can be fixed. Since disposition of the Naval Annex property is still in the future, the most expedient potential for expanded container facilities beyond that which the Mystic Terminal can satisfy would be joint use of the Sea-Land facility at Castle Island with back area obtained by relocation of one or more present tenants. This action should buy sufficient time to allow a final decision on the location for a new terminal.

Additional comments concerning the location of a new Public Container Terminal which must be borne in mind are:

1. Location at Castle Island would allow consolidation of container facilities at only two sites within the Harbor rather than three sites and would provide the least expensive alternative for on-site construction. Restrictions to overcome are FAA approval; extensive upgrading of highway access routes; and relocation of present shipping operations. Careful evaluation must be given to attempts to relocate existing revenue producing tenants at Castle Island. A particular concern would be loss of a tenant in lieu of his agreement to relocate.
2. Location at South Boston Naval Annex would mean a third site being developed for container operations but would provide a prime waterfront site if Castle Island restrictions cannot be overcome. Restrictions to be overcome are: GSA disposition of this property; potential for different use for tax revenue and job intensive use; and extensive upgrading of highway access routes with an upgraded Northern Avenue route recommended.
3. Location at the East Boston Terminal still remains suitable if restrictions at Castle Island cannot be overcome. This is the only site at which traffic movements could be restricted to an exclusive-use right-of-way separated from the adjacent local streets. Development of this site would mean a third location for facilities and would provide fewer potential acres for future expansion.

APPENDICES

Appendix A

CONTAINER FACILITIES

U.S. PORTS EAST COAST-NORTH ATLANTIC

Baltimore -	Proprietary (Canton Co.) Leased to Sealand
1974	27.5 ton Bridge Crane MPA (Dundalk Marine Terminal) 6 berths, 7 container cranes one 122' ro-ro platform Consolidation sheds 3 total 192,500 sf
1976-78	Planned 2 more berths, one additional ro-ro platform, and two giant new consolidation sheds at Dundalk. In addition, 3 multi-purpose berths with container, break bulk cargo plus heavy lift capacity at Locust Point Marine Terminal including a transit shed, consolidation shed, one container crane, a whirley crane and a 150 ton heavy lift crane.
Boston -	Castle Island (Leased to Sealand to 1990)
1974	27-1/2 ton gantry crane 13 acre container berth. MPA Moran Docks have a 70 ton Hitachi, and a 45 ton Paceco container gantry and a storage area of 22 acres as well as a consolidation shed.
1976-78	No plans yet.
Ameriport - (Philadelphia) 1974	Packer Avenue Marine Terminal 105 acres 2 x 100,000 s.f. sheds 40 ft. approx., one 45 ton container crane (113'6" backreach 184 ft.), one 75 ton mobile crane. 3,140 ft. marginal wharf. One ro-ro berth of 825 ft. included in above. Transit sheds 360,000 sq. ft. Tioga Marine Terminal has 75 acres with 7 berths (marginal 3,220 ft. total) slip beat 725 ft., ro-ro berth 625 ft. One 45 ton container gantry as above.
1975-76	One additional 45 ton container crane at each terminal.
New York -	Port Elizabeth Marine Terminal 35 ft. depth. 18 berth, 17,000 ft. length, 1,000 acres of transit land, 18 gantry cranes 30-45 tons, 2 ro-ro berths, most berths are proprietary. Sealand, ACL, and various terminal operators. Port Newark. 35 ft. depth, 4 berth, 2 Paceco, 30 ton gantry cranes. 800 acres backland. 17 transit sheds, 10 acre railroad container transfer and storage yard. Weehawken. 40 ft. depth, 2 berth. Seatrain, 107 acres, 2 container cranes 60 tons.

New York - Stapleton Staten Island. 2 container cranes, 2 berths, 40 ft. draft.

Edgewater, N.J. 1 container crane, 1 berth, 35 ft. draft. Total Port of New York and New Jersey 25 gantry cranes, 27 berths and about 2,200 acres.

Hampton Roads
Norfolk, Va.- 45 ft. depth, Norfolk International Terminals. 2 container berths, 2x50 ton and 1x30 ton container gantry, 7x40 ton
Storage yard 2,400x20 ft. containers.

Halifax,
Nova Scotia- 56 acres, 1,762 ft. berth, depth 40-45 ft. Dock ramp. Two 45 ton container cranes. 42 ft. wide ro-ro ramp on separate pier.

1973 ACTIVITY

MORAN CONTAINER FACILITY

				IN & OUT			CONTAINERS					
	Amount of Ships	Net Tons		Total Net Tons	Full In		Full Out		Empty Out		Total Cont. In & Out	T.E.U.
		In	Out		20'	40'	20'	40'	20'	40'		
January 1973	13	10,445	6,754	17,199	525	363	265	268	233	93	1,747	2,471
February	8	8,531	4,126	12,657	388	259	189	147	153	126	1,262	1,794
March	11	11,883	8,716	20,599	535	446	295	375	259	56	1,966	2,843
April	10	11,767	6,281	18,048	559	357	257	262	167	52	1,654	2,325
May	11	13,317	7,642	20,959	616	441	236	351	276	30	1,950	2,772
June	20	16,614	9,409	26,023	694	546	418	395	226	73	2,352	3,366
July	21	16,752	10,753	27,505	697	611	417	407	175	97	2,404	3,519
August	20	16,279	8,117	24,396	702	588	288	356	155	151	2,240	3,335
September	20	16,136	11,479	27,615	680	539	365	497	197	140	2,418	3,594
October	23	19,624	14,627	34,251	796	748	478	587	139	87	2,835	4,257
November	19	21,316	13,174	34,490	933	730	401	541	182	127	2,914	4,312
December	17	23,966	16,393	40,359	933	783	442	713	216	47	3,134	4,677
TOTALS	193	186,630	117,471	304,101	8,058	6,411	4,051	4,899	2,378	1,079	26,876	39,265

1974 ACTIVITY
MORAN CONTAINER FACILITY

		IN & OUT			CONTAINERS							
	Amount of Ships	In	Out	Total Net Tons	Full In 20'	Full In 40'	Full Out 20'	Full Out 40'	Empty Out 20'	Empty Out 40'	Total Cont. In & Out	TOTAL T.E.U.
January 1974	20	15,338	14,965	30,303	609	649	447	629	169	37	2,540	3,855
February	15	17,919	12,369	30,288	879	534	442	456	34	28	2,373	3,391
March	23	25,028	20,491	45,519	1,072	888	846	793	85	20	3,704	5,405
April	19	19,440	18,363	37,803	820	769	635	739	169	98	3,230	4,836
May	10	10,862	6,539	17,401	403	395	151	334	28	11	1,322	2,062
June	20	17,953	21,452	39,405	668	690	708	949	129	40	3,184	4,863
July	20	19,263	16,850	36,113	750	749	608	654	221	68	3,050	4,521
August	21	18,668	15,912	34,580	763	697	587	637	131	80	2,895	4,309
September												
October												
November												
December												
TOTALS	148	144,471	126,941	271,412	5,964	5,371	4,424	5,191	966	382	22,298	33,242

REFERENCES

Seaport Study, Boston Redevelopment Authority; E. G. Frankel, Inc., April 1973.

The Boston Seaport, 1970-1990, Boston Redevelopment Authority; E. G. Frankel, Inc., January 1970.

New Containerization Facilities, Massachusetts Port Authority; CE Maguire, Inc., November 1973.

New Containerization Facilities Supplement, Massachusetts Port Authority; CE Maguire, Inc., February 1974.

All references included in these publications are applicable to this study.

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